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# ***JPRS Report***

# **Science & Technology**

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***USSR: Life Sciences***

# Science & Technology

## USSR: Life Sciences

JPRS-ULS-89-001

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UDC 632.4:635.25:582.28

**Protective Reactions in Onion to Penetration by Pathogenic and Nonpathogenic Fungi**

18400498c Leningrad MIKOLOGIYA I

FITOPATOLOGIYA in Russian Vol 22 No 2,

Mar-Apr 88 (manuscript received 21 Apr 87) pp 162-168

[Article by A. P. Dmitriyev, N. I. Gushcha, O. A. Zakordonets and D. M. Grodzinskiy, Institute of Botany imeni N. G. Kholodnyy, Ukrainian SSR Academy of Sciences, Kiev]

[Abstract] An analysis was conducted on the response reactions of the onion (*Allium cepa*) to hyphal penetration by pathogenic (*Botrytis allii*) and nonpathogenic (*Botrytis cinerea* and *Fusarium solani*) fungi. The purpose was an attempt to determine whether resistance in this case was due solely to mechanical/anatomical barriers or whether additional mechanisms were involved. The combination of histological, histochemical, and ultrastructural studies demonstrated that even high concentrations of the nonpathogenic fungi ( $10^5$  spores/ml) on the epidermal scales showed few attempts at penetration into the tissues. In those few cases where *B. cinerea* and *F. solani* formed infectious hyphae, thickening of the plant cell wall and formation of phenolic cytoplasmic granules were more pronounced than when the pathogenic agent was involved. It appears that in the case of the onion-specific pathogen *B. allii* the response is weaker. To date, there is no evidence that the granules may be fungistatic, although oxidative polymerization of the phenolic compounds may lead to cell wall thickening. Figures 3; references 10: 8 Russian, 2 Western.

UDC 631.523+632.4:633.11

**Effect of Maternal Cytoplasm on Soft Wheat Resistance to Leaf Rust**

18400505 Kiev TSITOLOGIYA I GENETIKA in

Russian Vol 22, No 3, May-Jun 88 (manuscript received 13 Mar 86) pp 34-37

[Article by Ye. A. Voluyevich and A. N. Palilova, Institute of Genetics and Cytology, BSSR Academy of Sciences, Minsk]

[Abstract] The principal means of controlling leaf rust in wheat is based on the introduction of resistant lines by intraspecies hybridization. The direction of hybridization and the genetics of resistant characteristics are two

important aspects in these efforts. The genetics of the resistance of soft spring wheat to strain 77 of the leaf rust pathogen was studied. Significant reciprocal differences in resistance were observed in hybrids obtained from crossing the susceptible Mironovskaya 808 variety with the resistant Red River 68 and the Lee varieties. These differences were related to the modifying effect maternal cytoplasm has on the expression of nuclear resistance genes. The differences among reciprocal hybrids of Mironovskaya 808 crossed with Leningradka could be due to the heterogeneity of the Leningradka plants. No cytoplasmic effect was noted when Mironovskaya 808 was crossed with Kenya Plume or Jaral 66. References 10: 7 Russian, Western.

UDC 633.11:632.938

**Immunochemical Study of Cytoplasmic Proteins in Monogenic Lines of Marquis Wheat Differing in Resistance to Stem Rust Pathogen**

18400510 Moscow VESTNIK MOSKOVSKOGO

UNIVERSITETA. SERIYA 16: BIOLOGIYA in

Russian No 2, Apr-Jun 88 (manuscript received 4 Mar 86) pp 61-65

[Article by Ye. V. Yurina and A. M. Umnov]

[Abstract] A decisive role in the regulation of the interactions between host and pathogen is played by the genetic apparatus of both organisms. Resistance and susceptibility to various diseases are determined genetically in a plant by the protein components of the host and the pathogen. The goal of this study was to determine the specific isoenzyme composition of soluble protein peroxidase in Marquis wheat leaves in normal plants and in plants infected with the *Puccinia graminis* pathogen. It was shown that resistant wheat lines (Sr 11, Sr Tt) exhibited higher molecular heterogeneity of peroxidase than did the susceptible lines (Sr 8, Sr 9B). Antigens with an average electrophoretic mobility of 0.4-0.5 were found to be specific to the resistant lines. Their activity increases in pathogenesis. Resistance in wheat leaves is associated with catalytically active proteins with a molecular weight of about 40,000 D. It was concluded that oxidation system heterogeneity, coupled with the presence of resistant genes, may be used in evaluating plant susceptibility to the pathogens studied. Figures 3; references 11: 11 Russian.

**Anticholinesterase Activity of Unsaturated Choline Phosphate Analogs**

18400024 Kiev DOKLADY AKADEMII NAUK UKRAINSKOY SSR. SERIYA B: GEOLOGICHESKIYE, KHIMICHESKIYE I BIOLOGICHESKIYE NAUKI in Russian No 7, Jul 88 (manuscript received 16 Mar 88) pp 35-39

[Article by Yu. G. Gololobov, L. F. Kasukhin, A. S. Oganessian, G. P. Mozgovaya, A. I. Panasyuk, and V. S. Petrenko, Institute of Bioorganic Chemistry, UkSSR Academy of Sciences, Kiev; Institute of Organic Chemistry, UkSSR Academy of Sciences, Kiev]

[Abstract] Choline phosphates inhibit cholinesterases, and the introduction of a multiple bond in alkyl phosphates is known to increase their ability to inhibit cholinesterases. The kinetics of the inhibition of acetylcholinesterase (ACE) obtained from human erythrocytes by phosphoric acid vinyl esters containing a quaternary atom of nitrogen or phosphorus were studied to determine the anticholinesterase activity of unsaturated choline phosphate analogs. Complete esters were obtained through alkylation of trimethylamine or trialkylphosphines with allylchlorides. Thermal dealkylation produced the corresponding betaines. The residual enzyme activity in relation to acetylcholine iodide was determined potentiometrically, with time-controlled incubation with the inhibitor. The two reaction centers—onium and phosphorus—react with the ACE independently of each other. The ammonium group in a number of complete ethers compensates for the strong deactivation caused by the steric screening of the phosphorus. The introduction of the first Cl atom is accompanied by a 136-fold increase in the bimolecular rate constant for irreversible inhibition ( $k_a$ ); the second Cl atom results in an additional 5.3-fold increase. A similar tendency is also observed in reversible inhibition. The effect of the acceptor ammonium group is seen primarily on the strength of the associate, and during the stage of phosphorylation, it is extremely weak. The anticholinesterase activity of the betaines decreased sharply, by 2-3 orders of magnitude, compared to the corresponding complete esters, possibly because the O<sup>-</sup> atom hinders the associative binding of the inhibitor with the active ACE surface.

**Specific Binding of Phenol-Containing Antioxidant With Cell Membranes and Its Inhibition by Some Biologically Active Substances**

18400415c Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 300 No 2, May 88 (manuscript received 13 Oct 87) pp 494-497

[Article by A. P. Khokhlov, Scientific Research Institute of Urology, Moscow]

[Abstract] Experimental data presented in this article indicate the existence of specific binding sites for a synthetic water-soluble antioxidant from some sterically hindered phenols in cell membranes of different rat organs. The following membrane preparations used in the study were obtained from male Wistar rat organs by standard methods: plasma membranes of small intestine enterocytes, cardiocyte plasma membranes, hepatocyte plasma membranes and brain synaptosomes. The water-soluble synthetic antioxidant  $\gamma$ -(4-hydroxy-3,5-di-tert-butylphenyl)propionic acid (fenoan) and  $^3\text{H}$ -fenoan were used. The studies showed the presence of specific reversible binding of  $^3\text{H}$ -fenoan with all membrane fractions studied. There were 2 types of specific binding sites of the antioxidant. Values of dissociation constants were practically identical, but there were significant differences in concentrations of binding centers for  $^3\text{H}$ -fenoan. Use of preparations which possess biological activity showed that some substances effectively force out  $^3\text{H}$ -fenoan from centers of specific binding. The experimental data obtained justified the assumption that, during assessment of biological effects caused by interaction of phenol-containing antioxidants with cell membranes, it is necessary to consider not only the nonspecific binding of the latter with biomembranes, changing the physicochemical state of the lipid bilayer, but also the complex formation of the antioxidants with specific binding centers on the cell surface. The receptor interaction with the cells may explain the presence of biological activity of phenol-containing antioxidants at less than micromolar doses. Inhibition of specific binding of  $^3\text{H}$ -fenoan with cell membranes of the rat organs by catecholamines may indicate that high affinity binding of the antioxidant from the shielded phenols class was partially due to complex formation with catecholamine receptors which is rather heterospecific with respect to ligands of similar chemical structure. Figures 3; references 10: 6 Russian; 4 Western.

UDC 591.148.1

**Bioluminescence Activity and Concentration of  $\text{Ca}^{2+}$ -Dependent Photoprotein in Hydroid Colonies of *Obelia longissima* (Pallas, 1766) (Hydrozoa, Thecaphora, Campanulariidae)**

18400478 Moscow ZHURNAL OBSHCHEY BIOLOGII in Russian Vol 49 No 3, May-June 88 (manuscript received 10 Apr 86) pp 381-387

[Article by V. N. Letunov and Ye. S. Vysotskiy, Zoological Institute, USSR Academy of Sciences, Leningrad; Institute of Biophysics, USSR Academy of Sciences Siberian Branch, Krasnoyarsk; first paragraph is abstract]

[Text] A study was made of the luminescence activity of *Obelia longissima* zooids isolated from colonies. It was shown that the maximum light production of a zooid at ecological temperature ( $+4^{\circ}$ – $+6^{\circ}\text{C}$ ) is equal to  $3.5 \times 10^{10}$  quanta of light, which corresponds to  $0.9 \times 10^{-2}$  micrograms of photoprotein. During the time period of favorable growth conditions for colonies (autumn-winter), it is possible to collect from 1 m of artificial substrate up to 387 g of raw biomass of the hydroids, which contains up to 11 g of active obelin.

The capacity to produce light is found in many groups of sea hydrobionts (Morin, 1983). Among these, the largest number of light-producing organisms belongs to the Coelenterata, among which the luminescing types are represented in all subclasses of the phylum. In the hydrozoa subclass, only the thecaphora hydroids luminesce, while the athecates lack this capacity (Morin, Reynolds, 1974). Among the luminescing species, the most fully studied are the colonial hydroids of the genus *Obelia* (Morin, Reynolds, 1974; Morin, Cooke, 1971). Among these, four luminescing species have been observed: *O. geniculata*, *O. bicuspidata*, *O. commisuralis*, *O. longissima* (Morin, 1974, 1983). The luminescence system of these animals is located within specialized photocyte cells and is analogous in nature to the system described for the hydroid medusa *Aequorea forskalia* (Shimomura et al., 1962), consisting of a protein known as a photoprotein, which produces light when it interacts with calcium ions. The high sensitivity and specificity for  $\text{Ca}^{2+}$  makes the photoproteins of Coelenterates a useful instrument for detecting changes in the concentration of this cation within living cells (Blinks, 1982). In order to light up the photocytes fully, chemical stimulation using a solution of 70 percent ethanol or 0.54 M KCl is most frequently used (Morin, Cooke, 1971). Recently, the milder effect of a 0.25 M solution of KCl, with simultaneously increased external concentration of  $\text{Ca}^{2+}$  (Anderson, Cormier, 1978), has been used. In this instance, the luminescence is caused both by the intracellular  $\text{Ca}^{2+}$  coming from depots and by the extracellular  $\text{Ca}^{2+}$  which flows into the cell through the Na-dependent  $\text{Ca}^{2+}$ -channels which open up upon  $\text{K}^{+}$ -depolarization of the cytoplasmic membrane.

Basic research on hydroid luminescence has been carried out on *O. geniculata*, where the photocytes are scattered

throughout the entire colony. This makes it difficult to get a precise quantitative assessment of the light produced, since it is reflected and scattered by supramembrane structures, such as the mesoglea and perisarc (Morin, Cooke, 1971). Another hydroid species of this genus, *O. longissima*, has a cluster organization of photocytes, which are located in the gastrodermis of the distal portions of the hydranth stalks. This makes it possible to record the luminescence of isolated zooids and, to a considerable extent, prevent reflection and scattering of the light. The latter served as the basis for work done in the study of the bioluminescence activity of *O. longissima* zooids and in the analysis of the effect of the temperature, regeneration, and maturity of the hydranths on their bioluminescence activity. Based on morphometric study of the colonies and luminescence of zooids, a quantitative assessment of the concentration of photoprotein per unit weight of the raw biomass has been carried out.

**Materials and Methods**

The study was conducted on colonies of *O. longissima* which were collected daily from artificial substrates suspended on carriers in an experimental section of a salt-water mussel-raising facility (Kulakovskiy, Kunin, 1983) located in the vicinity of the Belomorsk Biological Station of the USSR Academy of Sciences Zoological Institute (Kartesh), in the waters of Chupa Bay of the Kandalaksha Gulf. The work was carried out in the autumn (October-November), during which *O. longissima* colonies grow intensely, reaching their greatest dimensions (Letunov, Stepanyants, 1987).

Ophthalmic scissors were used to isolate the zooids for the experiments; they were separated from the body of the colony in such a way that the distal portion of the stalk, which contains a cluster of photocytes, was taken along with the hydranth (Fig. 1). After regeneration in sea water in accordance with the recommendations described in the work of V. N. Letunov (1981), the zooid was transferred into a vessel containing 200 microliters of seawater, to record luminescence. Since the cluster of photocytes was located next to the cutting site, it was assumed that scattering of the emitted light to the perisarc would not occur.

Luminescence was recorded using a bioluminometer whose block diagram is presented in Fig. 2. The bioluminometer consisted of a light-free chamber in which the vessel with the sample was placed. The top of the chamber was closed off by a plug impermeable to light, through which, using an automated micropipette, a solution stimulating light emission was fed. In the side wall of the chamber there was a recording aperture with a light guide leading to an FEU-64 photoelectric cathode. The signal thus obtained was recorded on the tape of an automatic recorder. Calibration of the device in energy units was carried out according to the standard described in the work of A. M. Fish (1969).

Luminescence of the zooid was evoked by adding a solution of potassium chloride and calcium chloride to





Figure 1. Cluster of photocytes in the hydranth stalk.

concentrations of 500 and 180 mM, respectively. The volume of each portion of the solution was 200 microliters.

Photocytes in the zooids being studied were identified under an MLD-1 luminescent microscope, where the cells appeared as brightly shining green spots. The luminescence evoked in the photocytes is governed by what is known as green membrane-bound protein, which belongs to the light-emitting system of the cell (Morin, Reynolds, 1974).

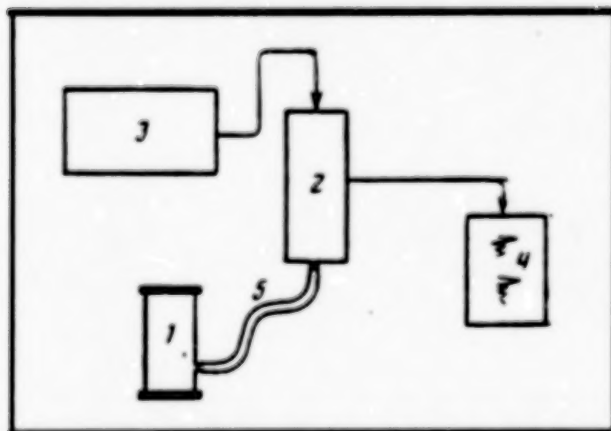


Figure 2. Block diagram of the bioluminometer:  
1—measuring chamber, 2—FEU-64 photomultiplier;  
3—feed source [of the solution], 4—automatic recorder,  
5—light guide.

## Results

If the zooid was placed in the recording vessel immediately after isolation from the body of the colony, then when the stimulating solution was added, a weak single burst was observed (Fig. 3, upper graph) with an amplitude of  $(0.4-2.4) \times 10^9$  quanta/sec and a duration of 2 to 15 sec. In addition, under such conditions of the experiment, in certain cases no luminescence response at all was observed in the zooid. But if the hydranth was given the opportunity to regenerate, then the amount of the light response substantially increased (Fig. 3, lower graph). As the figure shows, in the second case the luminescent burst is also a single impulse whose maximum amplitude can reach  $2.1 \times 10^{10}$  quanta/sec, with a duration of 3-12 sec. From time to time, luminescence responses of lesser amplitude were observed, with a minimum value of  $4.4 \times 10^9$  quanta/sec.

The results of the effect of temperature on zooid luminescence are presented in Fig. 4. Organisms kept at a

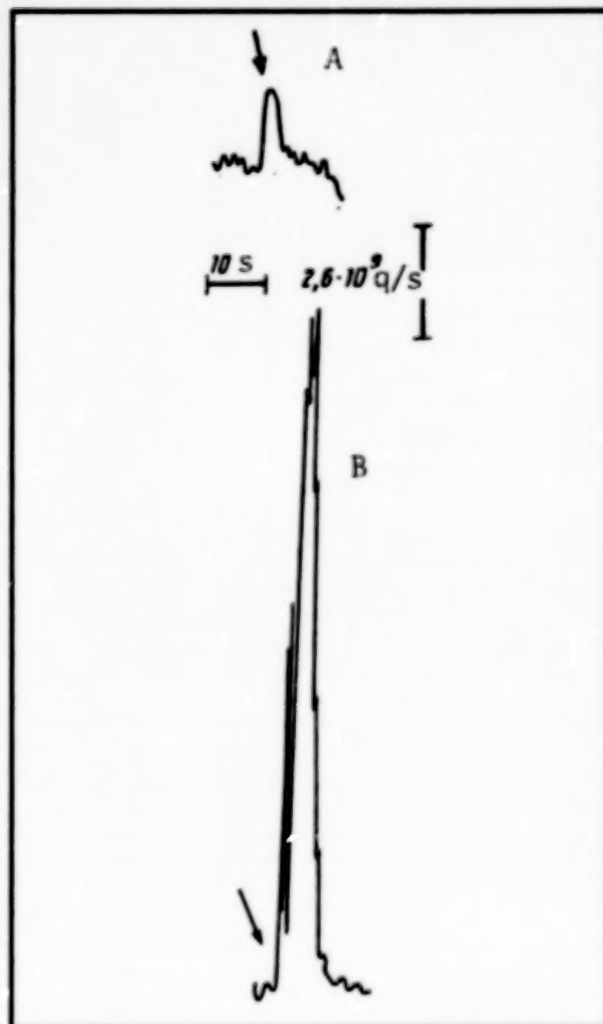


Figure 3. Luminescence responses: nonregenerated (upper graph) and regenerated (lower graph) zooids.



temperature of 0°C for more than 40 minutes respond to the standard chemical stimulation with a burst (Fig. 4, A) whose amplitude and duration lie in the same intervals as do the nonregenerated hydranths. The smallest amplitude is  $0.2 \times 10^9$  quanta/sec and the greatest is  $2.2 \times 10^9$  quanta/sec, while the duration varies within the limits of 1.2-1.5 sec. Frequently, luminescence is not observed at all with standard chemical stimulation.

For organisms acclimated to the ecological temperature (4-6°C), the nature of the light response is sharply distinct from the foregoing. The zooid responds with a burst of light consisting of 5-8 impulses (Fig. 4, B). The leading edge of the burst is made up of 3-5 impulses, and the amplitude of each successive impulse is higher than the amplitude of the preceding one, which causes a steep increase in the leading edge. The trailing edge of the burst, consisting of 2-3 impulses, is not as steep, but the amplitude of each successive impulse is less than the amplitude of the preceding one. The slope of the trailing edge can probably be explained by the progressive increase in the duration of impulses as the burst diminishes. The total duration of the impulses of the trailing edge is 7-10 sec, while the duration of a single impulse of the leading edge does not exceed 500 ms. The first impulse of the burst is the smallest, with an amplitude of  $1.3 \times 10^9$  quanta/sec, while the amplitude of the largest, central impulse is  $12.3 \times 10^9$  quanta/sec.

Acclimation to increased temperature (17°C) causes a change in the luminescence of the zooids (Fig. 4, C). In this case the luminescence responses of the hydranths occur as single impulses with a maximum amplitude of  $2.8 \times 10^{10}$  quanta/sec and a duration of 2-7 sec.

The substantial variation in intensity of luminescence responses of the zooids is apparently caused by the heterogeneity of the group studied, which is determined, to a considerable extent, by the various stages of maturity of the hydranths. For example, it is well known (Marfenin, Kosevich, 1984) that in colonies of the Campanulariidae family regular resorption of old zooids and formation of new individuals occurs. The average lifespan of an individual hydranth in this process is 6-7 days. For *O. longissima*, just as in colonies of other species of the Obelia genus, the most intensive death rate of the zooids occurs in the oldest, proximal part of the shoot, and, ultimately, a bare stalk devoid of branches with zooids is left at the base (Fig. 5). According to our calculations, the number of young zooids just emerged from hydrothecae is no higher than 5 percent on a shoot 15-20 cm long. The phenomenon of different stages of development of the zooids makes it necessary to compare the luminescence activity of newly formed and mature hydranths.

Before the experiment, zooids isolated from the colony were given time to regenerate and acclimate to the temperature of the experimental solutions (13°C). Newly formed hydranths responded to the standard chemical stimulus with a weak light burst whose maximum amplitude was  $2 \times 10^9$  quanta/sec, with a duration of 2-5 sec.

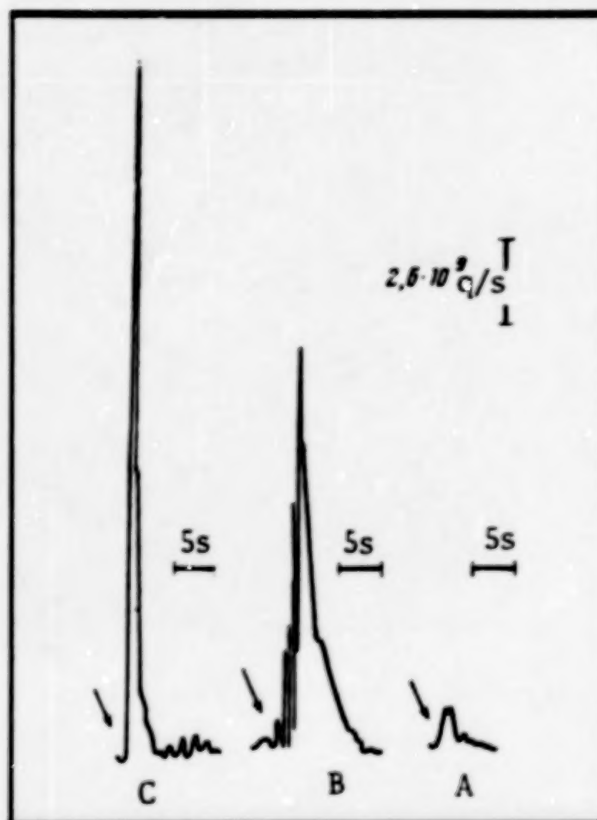


Figure 4. Luminescence responses of zooids acclimated to: A—0°C, B—4-6°C, C—7°C.

Quite frequently, young zooids did not respond to stimulation. Checking these hydranths under a luminescent microscope showed that for them the cluster of photocytes in the distal part of the stalk is either very small or completely absent. The latter condition is evidence that formation of a gastrodermal cluster of photocytes in a zooid's stalk occurs after its emergence from the hydrotheca, and not during the time of morphogenesis of the hydranth bud, as in *O. geniculata* (Morin, Reynolds, 1974). This is also confirmed by the fact that in both the hydranth and the trunk buds of *O. longissima* we recorded no light bursts in response to chemical stimulation.

In mature hydranths, microscopic examination always reveals a cluster of fluorescing photocytes in the stalk, and the luminescence of the zooids corresponds to this. Thus, a mature hydranth responds to chemical stimulation with a bright burst of light consisting of 3-10 impulses. The greatest amplitude of the impulses is  $2.1 \times 10^{10}$  quanta/sec, and the smallest is  $4.4 \times 10^9$  quanta/sec. The duration of the burst is 3-12 sec.

In a stalk of resorbed zooids, fluorescing photocytes can be observed up until complete "resorption" of the body of the hydranth. During this process, the photocytes retain the ability to respond to chemical stimulation with a luminescent burst.

In order to analyze the concentration of photoprotein in the colonies, we measured the amount of light produced by

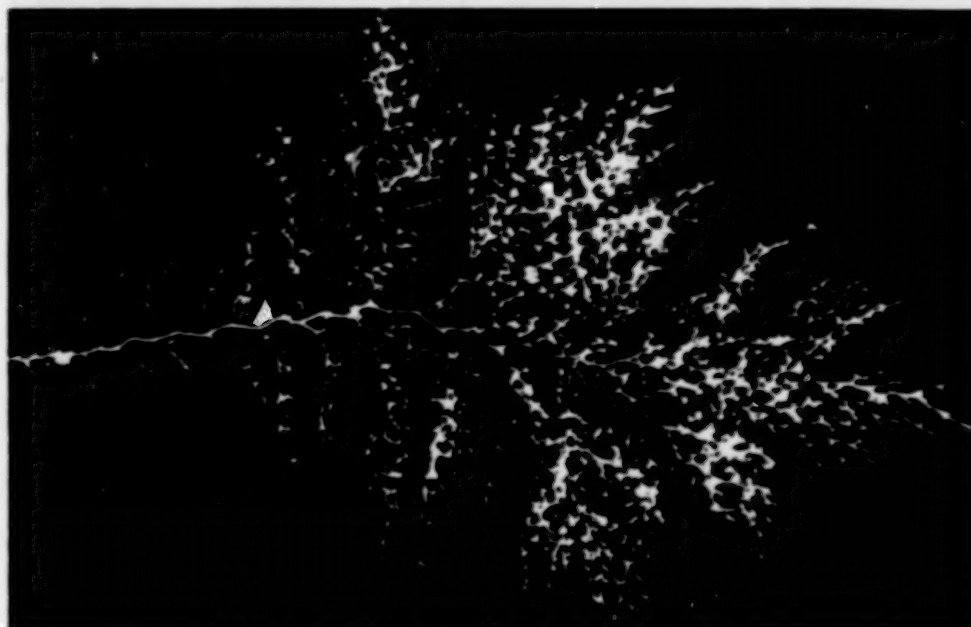


Fig 5. "Average" shoot of a colony (length 17 cm)

a single zooid and the dimensions of all shoots (length, weight) collected from 1 m of substrate suspended in the surface layer of seawater (0-5 m). The results of morphometric processing are presented in Table 1.

In order to determine the quantity of light produced, we calculated the constant for the rate at which the luminescent burst of the zooid diminished (K) (Morin, Cooke, 1971) during its chemical stimulation. The value of K is a function of temperature. Thus, at ecological temperature (4-6°C)  $K = 0.38 \text{ sec}^{-1}$ , and when it is increased to 17°C,  $K = 2.7 \text{ sec}^{-1}$ . From this it was calculated that the maximum quantity of light produced by an isolated zooid at ecological temperature is equal to  $3.5 \times 10^{10}$  quanta; at the elevated temperature,  $1 \times 10^{10}$  quanta. Thus, increasing the temperature by 10° reduces the zooid's light production by a factor of three. In calculating the quantity of light produced by an individual shoot and by the entire colony, the first figure was used.

From the results presented in Table 1 it is clear that the shoots 15-20 cm long have the greatest biomass and the greatest number of zooids. This provides the grounds for performing calculations of photoprotein concentration

on the basis of an average shoot with a length of 17 cm. The number of hydranths on a shoot of this length can vary between 5,000 and 9,000.

In order to calculate the photoprotein concentration in colonies, the following assumptions were made: 1) the number of zooids on an average shoot is 7,000; 2) no more than 5 percent of the nonluminescing hydranths are located on the average shoot; 3) at ecological temperature, 4-6°, an individual zooid is capable of producing  $3.5 \times 10^{10}$  quanta of light. The latter figure corresponds to  $0.9 \times 10^{-2}$  micrograms of photoprotein, since it is known that 1 mg of aequorin, which is analogous to obelin, releases  $4 \times 10^{13}$  quanta of light (Shimomura, Shimomura, 1984).

Calculations showed that there are 28.5 micrograms of active photoprotein per 1 g raw weight of colonies. Using this figure, we calculated the light production of all shoots of the colonies collected from 1 m of substrate. The data presented in Table 2 show that during the period of time favorable for growth of the colonies (autumn-winter), from 1 m of artificial substrate an amount of biomass of colonies may be collected which contains up to 11 mg of active photoprotein.

Table 1—Morphometric Characteristics of *O. longissima* Colonies Collected From 1 m of Substrate

Group No	Linear Dimensions of the Shoots, cm	No of Shoots	Total Weight of the Shoots, g	Weight of the Average Shoot, g
1	5-10	43	18.07	0.4
2	10-15	48	46.4	0.95
3	15-20	65	136.5	2.1
4	20-25	25	115.6	4.6
5	Over 25	9	70.1	7.8
		197	387	—

Table 2—Content of Photoprotein in *O. longissima* Colonies Collected From 1 m of Substrate

Group No	Quantity of Photoprotein in the Average Shoot, mg	Total Quantity of Photoprotein in the Group of Shoots, mg
1	0.011	0.51
2	0.027	1.32
3	0.060	3.89
4	0.131	3.29
5	0.222	2.00
		11.01

## Discussion

The data obtained make it possible to conclude that the luminescence of the photocytes concentrated in the stalk of the zooid is a temperature-dependent process. When the temperature is increased by 10°C, light production is reduced by more than a factor of 3 from the level at ecological temperature (4-6°C); and when the temperature is reduced to 0°C, light production is reduced by a factor greater than 100. A possible explanation for this phenomenon is that the photoprotein responsible for the reaction of the photocytes' lighting up is capable of functioning in a fairly narrow temperature interval. This hypothesis is supported by the fact that up to 20 isozymes of photoprotein have been discovered in the hydromedusa *Aequorea forskalia* which differ little in their amino acid composition, despite differing electrical charge (De Luca, 1978).

The kinetics of the light response of zooids adapted to ecological temperature may be explained by the fact that rapid, high-amplitude impulses are induced by intracellular  $Ca^{++}$  liberated from depots under the influence of luminescence potentials. The slow light impulses which constitute the phase in which the burst diminishes are induced by extracellular  $Ca^{++}$  flowing into the cells through  $Na^{+}$ -dependent  $Ca^{++}$ -channels of the cytoplasmic membrane which open up as a result of  $K^{+}$ -depolarization. The latter phenomenon is supported by the data of Anderson and Cormier (Anderson, Cormier 1978), which demonstrated similar kinetics of luminescence responses. The role of luminescence potentials in inducing light impulses is thoroughly examined in the work of Morin and Cooke (Morin, Cooke, 1971). But there is as yet no explanation of the mechanisms associated with the rapid release and binding of intracellular  $Ca^{++}$ .

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**Reconstruction of Single Calcium Channels of Synaptic Membranes in Artificial Phospholipid Membranes**

1840041Sa Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 300 No 2, May 88 (manuscript received 26 Nov 87) pp 469-471

[Article by Yu. V. Sokolov, Institute of Physiology imeni A.A. Bogomolets, UkSSR Academy of Sciences, Kiev]

[Abstract] A study of properties of calcium channels incorporated into an artificial phospholipid membrane used bilayer lipid membranes formed by the Mueller method or by the popular method of forming artificial membranes on glass micropipets. The electrolyte solution surrounding the membrane contained 200 mM  $\text{BaCl}_2$  and 10 mM of tris-HCl at pH 7.4. Incorporation of ionic channels into the bilayer lipid membranes involved fusion of closed fragments of synaptic membranes and a flat membrane. Current fluctuations through the membrane appeared within several minutes after introduction of the synaptic membrane preparation from the cis-side of the bilayer lipid membranes, regardless of the method by which they were formed. Fluctuations showed a linear dependence on the membrane potential in the range of potentials from -75 up to -150 mV. Channel conductivity was 10 pS in 200 mM  $\text{BaCl}_2$  and 5-6 pS in 200 mM of  $\text{CaCl}_2$ . Cadmium ions were effective calcium channel blockers and changed their amplitude significantly. Data concerning the selectivity and potential-dependence of the channels studied and the influence of Cd ions on them confirmed the assumption that the current fluctuations recorded through the bilayer lipid membrane were caused by the activity of potential-dependent calcium channels of the synaptic membranes. Figures 3; references 14; 3 Russian; 11 Western.



**Soviet Cooperation with Danish Biotechnology Firm**

18400002 Moscow PRAVDA in Russian 17 Aug 88 p 4

[Article by Yu. Kuznetsov, special Pravda correspondent: "A Stake in the Newest"]

[Abstract] A 1986 agreement on scientific and technical cooperation between the USSR and the Danish concern NOVO involves, primarily, the production of insulin. NOVO is said to have subsidiaries in 26 countries and sells its products in 120. A drug and biotechnology

company, it is said to be the world's largest producer of commercial enzymes and the second-largest seller of insulin. Pierre Bidermann, a NOVO director, is quoted as saying that NOVO is ready to help the USSR modernize its insulin production and even build a new enterprise. He indicated the possibility of the two parties exchanging research on the development of human insulin. Although the Soviet public has recently expressed doubts about the safety of biotechnology enterprises, NOVO's state-of-the-art technology, its highly efficient production practices, and its proximity to residential areas in Copenhagen are cited as indications that such enterprises are ecologically safe.

**Primary Structure of Chromosome-Specific  
Human Alpha-Satellite DNA**

18400467 Moscow DOKLADY AKADEMII NAUK  
SSSR in Russian Vol 300 No 5, Jun 88 (manuscript  
received 28 Dec 87) pp 1235-1239

[Article by I. A. Aleksandrov, T. A. Akopian, Ye. A. Vinnik, S. P. Mitkevich, L. L. Kiselev and Yu. B. Yurov, All-Union Scientific Mental Health Center, USSR Academy of Medical Sciences; All-Union Scientific Research Institute of Agricultural Biotechnology, All-Union Academy of Agricultural Sciences imeni V.I. Lenin; Institute of Molecular Biology, USSR Academy of Sciences, Moscow]

[Abstract] Analysis of the primary structure of chromosome-specific alpha DNAs involved sequencing of

nucleotide sequences specific for chromosomes 1 (pYAM9-75), 4 (pYAM11-39 and 18 (pYAM4-22), with the primary structure being determined by the Maxam and Gilbert method. Analysis of alpha sequences specific for chromosomes 1, 4 and 18 showed that each chromosome has a unique structure of repeating units of a high order, but the periodicity of some restrictive sites may coincide. Chromosome-specific families of one perichromosomal group are constructed from similar types of monomers and are highly homologous. The study confirmed the assumption that members of each perichromosomal family originate from a single ancestral structure which evolved by means of interchromosomal transfers, accompanied by multiple amplification events. Figures 2; references 10: 2 Russian; 8 Western.

UDC 577.1.083.3:595.44.7

### Paraspecific Action of Antiserum Against *Latrodectus* Spiders

18400500 Tashkent UZBEKSKIY BIOLOGICHESKIY  
ZHURNAL in Russian No 2, Mar-Apr 88 pp 3-5

[Article by V. S. Safarova, A. A. Akhunov, M. T. Adylbekov, Sh. I. Salikhov, Institute of Bioorganic Chemistry, Uzbek SSR Academy of Sciences]

[Text] At the present time eight species of spiders of the genus *Latrodectus* are known. Among them, the black karakurt (*Latrodectus tredecimguttatus*), the white karakurt (*Latrodectus pallidus*), and the Dahli karakurt (*Latrodectus Dahli*), which are found in Central Asia, cause substantial damage to livestock breeding and are dangerous to man.

Since one of the effective means of treating and preventing the consequences of poisoning from venom of the *Latrodectus* spiders is antivenins, obtaining highly active hyperimmune serums is an urgent problem.

In connection with the therapeutic properties of serums, the question arises as to what extent an antiserum obtained from one of the species of spiders neutralizes the toxic action of the venom of the other species.

The specificity of action of antisera for the venom of spiders of genus *Latrodectus* has been studied fairly completely. The venoms of the various species of *Latrodectus* spiders share several antigens, and an antiserum for one of the species neutralizes the effect of the others [1-3].

We studied the antigenic properties of the toxic components of the venoms of *Latrodectus* spiders and assessed the possibility of using an antiserum produced by the USSR Ministry of Health Tashkent Scientific-Research Institute of Vaccines and Serums against bites of the white karakurt (*Latrodectus pallidus*) and *Latrodectus Dahli*, as well as using a serum which we obtained for the venom of the *Latrodectus pallidus* spider in cases of bites by other species of spiders in this genus.

Whole venoms of the spiders *Latrodectus tredecimguttatus* and *Latrodectus pallidus* were obtained from mature females using a chelicera preparation, with subsequent homogenization and centrifuging at 20,000 rev./min over the course of 30 minutes. The supernatant was separated out and lyophilized. We obtained a serum against the venom of the white karakurt by immunization of donkeys using subcutaneous injection of whole venom [4]. The venom and serum preparations were stored in ampules at a temperature of 0-5°C in lyophilized form. The venoms of the *Latrodectus* spiders were fractionated according to the method reported in [5]. Homogeneity of the fraction obtained was controlled using disk-electrophoresis in a 10 percent polyacrylamide gel (pH = 8.9) in the presence of sodium dodecyl-sulfate (DDS-Na) by the method reported in [6]. LD<sub>50</sub> was calculated by the method reported in [7]. In order to determine the amino acid makeup 0.01-0.02 micromoles of the toxins were hydrolyzed for 24 hours in 0.5 ml 5.7 normal HCl in vacuum-sealed ampules at 110°C. The amino acid analysis was carried out on a D-500 automatic analyzer (Durrum, USA). Immunodiffusion was carried out by the Ouchterlony method in 1 percent Difco agar according to the standard method [8]. The neutralizing activity of the antisera was evaluated by the method reported in [2].

Whole venoms of the *Latrodectus* spiders are complex multicomponent systems. With electrophoresis in a 10 percent polyacrylamide gel, 15 components were discovered in the venom of the black karakurt, approximately 14 in the venom of the white karakurt, and 12 in the venom of the Dahli karakurt [5].

Two types of neurotoxins of a protein nature were isolated from the venoms of the *Latrodectus tredecimguttatus* and *Latrodectus pallidus* spiders;  $\alpha$ -latrotoxin and  $\alpha$ -LP-latrotoxin, and  $\beta$ -latrotoxin and  $\beta$ -LP-latrotoxin, with molecular weights of 130,000 and 30,000 daltons, which cause the toxic effect of the venom. Moreover, it has been found that the physicochemical properties of the venom, the amino acid composition, and the structural characteristics of the neurotoxins isolated from the various species of spiders are similar.

Taking into account the possibility of identical determinant portions and antigen properties of  $\alpha$ - and  $\beta$ -neurotoxins from the various species of *Latrodectus* spiders, we studied neutralization of the action of the venom of some species of spiders by antisera obtained from other species.

#### Amino Acid Composition of Neurotoxins From the Venoms of Spiders of the Genus *Latrodectus*

Amino Acid	$\alpha$ -LP-latrotoxin*	$\alpha$ -latrotoxin	$\beta$ -latrotoxin	$\beta$ -LP-latrotoxin
ASP	160	160	80	95
THR	67	65	29	31
SER	73	73	33	29
GLU	138	164	67	83
PRO	52	51	34	29
GLY	73	71	38	37
ALA	82	80	40	37

**Amino Acid Composition of Neurotoxins From the Venoms of Spiders of the Genus *Latrodectus***

Amino Acid	$\alpha$ -LP-latrotoxin*	$\alpha$ -latrotoxin	$\beta$ -latrotoxin	$\beta$ -LP-latrotoxin
VAL	59	59	49	39
MET	22	14	12	12
ILE	60	58	38	40
LEU	104	106	59	65
TYR	42	40	25	24
PHE	58	51	34	33
HIS	34	33	23	25
LYS	82	79	36	38
ARG	51	54	37	37
TRP	—	—	4	6
1/2 CYS	—	—	13	13
Molecular weight	1157	1158	651	673
pI	5.1	5.1	5.2	5.2

The antiserum for the venom of the black karakurt in a dose of 0.04 ml neutralized the effect of 5LD<sub>50</sub> venom, while the antiserum for the venom of the white karakurt neutralized it in a dose of 0.01 ml. These same serum doses protected experimental animals from death when used 5, 10, and 15 minutes after injection of the venom.

Thus, antisera for the venoms of black and white karakurts in doses of 0.04 and 0.01 ml, respectively, neutralized the lethal action of 5LD<sub>50</sub> venom of *Latrodectus tredecimguttatus* and 5LD<sub>50</sub> venom of *Latrodectus pallidus*.

In order to assess the effectiveness of action of the antisera against the venoms of black and white karakurts, we compared their neutralizing action with known samples of sera.

An antiserum for the venom of *Latrodectus mactans* [9] in a dose of 0.01 ml protected from death a guinea pig poisoned with 5LD<sub>50</sub> venom. In experiments on mice, the rabbit antiserum obtained by Wiener [10] in a dose of 1 ml neutralized the effect of 75LD<sub>50</sub> of venom. Our calculations show that 1 ml of the antisera of black and white karakurts neutralizes 125 and 500LD<sub>50</sub>, respectively, of the homologous venoms.

In experiments on mice, 0.01 ml of rabbit antiserum neutralized the effect of 5LD<sub>50</sub> of venom [2], and antisera for the venom of black and white karakurts operated analogously in doses of 0.04 and 0.01 ml, respectively.

In order to study the antigenic composition of the spider venoms, immunodiffusion was carried out on the venoms of *Latrodectus tredecimguttatus* and *Latrodectus pallidus* with various homologous antisera. The venoms of both spider species yield from 3 to 5 lines of precipitation with the homologous antisera. Interaction of the venom of the black karakurt with the antiserum of the white is characterized by a single distinct line and two weak lines of precipitation. The nonconstant

number of lines of precipitation is associated with species differences of the antigenic composition of the venoms being compared, or it is due to peculiarities of the interaction of individual antigens with the homologous antibodies.

In view of the fact that the antigenic properties of a venom are caused by the neurotoxins and that in toxicological experiments the antiserum of the white karakurt neutralizes the lethal effect of the venom of the black karakurt, and vice versa, the notion of the similarity and identicalness of lethal components of the venoms of *Latrodectus tredecimguttatus* and *Latrodectus pallidus* spiders is convincing.

A study of the precipitation reactions for isolated neurotoxins from the venoms of *Latrodectus* spiders against antisera for homologous venoms showed the presence of a single line of precipitation in all cases, which attests to the identical antigenic composition of the venoms of all species of *Latrodectus* spiders.

Thus, the antiserum which we prepared and the antiserum obtained in the Tashkent Scientific Research Institute of Vaccines and Serums correspond to foreign samples and possess paraspecific action, which makes it possible to use them on the bites of different species of spiders of the genus *Latrodectus*.

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**Application of Carbon Dioxide Laser in  
Emergency Surgery**

18400487a Frunze ZDRAVOOKHRANENIYE  
KIRGIZII in Russian No 1, Jan-Feb 88 pp 42-44

[Article by Ye. Ya. Mats and M. M. Mamakeyev, Chair  
of Surgical Diseases, No 2 Kirghiz State Medical Insti-  
tute]

[Abstract] An analysis was conducted on the efficacy of the  
carbon dioxide laser in 105 cases of gastrointestinal emer-  
gency surgery, in an attempt to lower the incidence of  
surgical complications. Assessment of the outcome data  
demonstrated that the use of the laser modality for both  
resection as well as coagulation with an unfocused beam  
had a beneficial effect. In general, the use of laser surgery  
involved less trauma and a more benign course of postop-  
erative recovery and markedly diminished the incidence of  
surgical infections. The use of the carbon dioxide laser  
with a 30 W power output was without adverse effects on  
tissue viability, and recovery of peristalsis occurred within  
three days in the majority of patients.

**Carbon Dioxide Lasers in Plastic Surgery of  
Pyogenic Wounds**

18400487b Frunze ZDRAVOOKHRANENIYE  
KIRGIZII in Russian No 2, Mar-Apr 88 pp 53-54

[Article by P. V. Pokrovskiy, I. K. Akybekov and M. A.  
Mateyev, Chair of General Surgery, Kirghiz State Med-  
ical Institute]

[Abstract] A study was conducted on the potential contri-  
bution of carbon dioxide lasers (Romashka-1) in lessening  
the incidence of pyogenic infections in plastic surgery.  
Using both split- and full-thickness grafts as well as treat-  
ment of the wound field with the laser reduced the length  
of hospital stay to an average of 22.05  $\pm$  1.55 days, as  
opposed to a hospitalization period of 30.71  $\pm$  3.0 days  
for conventional surgical management. In addition,  
musculocutaneous pedicle grafts were also found to be an  
effective approach to the management of pyogenic  
wounds, as well as the use of such musculocutaneous grafts  
in combination with microsurgical vascular anastomoses.  
The latter approach was sufficiently impressive in terms of  
the clinical results to preclude the need for additional  
treatment of the wound with the carbon dioxide laser.

UDC 616.348-002-08:615.549.19:546.291/.292

**Helium-Neon Laser in Combined Therapy of  
Chronic Colitides**

18400493a Kiev VRACHEBNOYE DELO in Russian  
No 4, Apr 88 pp 47-49

[Article by V. Ye. Neyko, Ivano-Frankovsk Medical  
Institute]

[Abstract] Therapeutic trials were conducted on the  
management of nonulcerative chronic colitides with the  
inclusion of helium-neon laser in an attempt to enhance  
conventional means of treatment. The study was con-  
ducted with 62 male and female patients ranging in age

from 27 to 68 years, using a LG-75-1 laser (0.63  $\mu$ m  
emission, 25 mW power output). Eight bioactive points  
were irradiated for 1.5 min (3.5 mW/cm<sup>2</sup>) each, with a  
total of 10-15 sessions. Inclusion of the helium-neon  
laser component led to marked objective and subjective  
improvements. Laser therapy also induced changes in  
weak chemiluminescence of blood plasma together with  
abatement of the inflammatory process in the colon,  
whereas these changes were not observed in patients that  
were not subjected to the laser therapy. In addition, laser  
therapy favored a decrease in the aggregative potential of  
erythrocytes and thrombocytes essentially to normal  
levels, a change that was more pronounced than that  
seen in patients on conventional therapy. These obser-  
vations suggest that laser therapy may have extensive  
applications in gastroenterology. References 7 (Russian).

UDC 616.33/.34-085.849.19-036.8-07

**Temperature Effects in Gastrointestinal Wall  
During Nd-YAG Laser Coagulation**

18400509a Moscow KHIRURGIYA in Russian  
No 5, May 88 (manuscript received 29 Apr 87) pp 76-79

[Article by V. A. Korolev and M. L. Stakhanov, candi-  
date of medical sciences, Institute of Radiotechnology  
and Electronics, USSR Academy of Sciences, Moscow]

[Abstract] Theoretical calculations were combined with  
experimental studies to assess the radius of thermal pen-  
etration of Nd-YAG laser radiation in the gastrointestinal  
tract when used in the coagulation mode. The results  
complemented one another in all essentials, with the dem-  
onstration that a ca. 350 W/cm<sup>2</sup> Nd-YAG laser beam,  
delivered via fiberoptic technology, was sufficient to  
increase the tissue temperature from 20°C to 60-80°C to a  
depth of 1.7-2.1 mm. These observations suggest that  
gastrointestinal malignancies may be selectively and spar-  
ingly destroyed by Nd-YAG laser since the degree of pen-  
etration encompasses the mucosa (0.3 mm) and the submu-  
cosal coat (1.8 mm), provided that the tumor has not  
breached the submucosal layer. In addition, these findings  
also demonstrated the feasibility of modeling the extent of  
laser penetration for thermal effects and, thereby, may  
facilitate the selection of optimum laser parameters for  
various tissues. Figures 4; references 5: 4 Russian, 1 West-  
ern.

UDC 616.13-004.6-085.849-19-06:616.13-005.6-  
02:616.13-001.02: 615.849.19

**Thrombogenic Characteristics of Vascular  
Endothelium After Laser Treatment**

18400509b Moscow KARDIOLOGIYA Vol 28 No 5,  
May 88 (manuscript received 1 Jul 87) pp 84-87

[Article by A. A. Belyayev, S. E. Ragimov, V. V. Dolgov,  
N. P. Furzikov, M. A. Bragin, R. S. Akchurin, V. S.  
Repin and A. V. Trubetskoy, All-Union Cardiological  
Scientific Center, USSR Academy of Medical Sciences;  
Central Institute for Advanced Training of Physicians,  
USSR Ministry of Health; NITsL [expansion unknown]  
USSR Academy of Sciences]

[Abstract] Studies were conducted on dogs with induced  
thrombosis [P. J. van Aken, et al., Artery, 8: 442, 1980]

to assess the effects of laser angioplasty on the vascular endothelium and recurrence of thrombosis. Recanalization of femoral and carotid arteries with the LTN-102 Nd-YAG laser (1.06  $\mu\text{m}$ ), using a quartz fiberoptic introduced via a balloon catheter for beam delivery, was shown to require an average energy of 26 plus or minus 4 J at 4.9 plus or minus 0.3 W and 5.1 plus or minus 0.7 sec exposures. The laser therapy yielded lumens 0.87 to 1.71 mm in diameter in 1-4 cm thrombi. In the absence of post-surgical anticoagulant therapy rethrombosis was evident in all cases within 5 to 10 days. Histological and ultrastructural examinations of the arteries showed extensive wall damage extending into the media. Thrombocyte perfusion studies of laser-damaged arteries and intact controls demonstrated high adhesion to the lesions. The density of thrombocytes adhering to injured areas ranged from 1,000 to 30,000 thrombocytes/ $\text{mm}^2$  within 40 min of perfusion, representing a concentration 2 to 3 orders of magnitude greater than seen on the normal endothelium. These observations demonstrated that endothelial damage was evidently a significant factor in the rapid occlusion of the lumens. Furthermore, comparative studies with Nd-YAG, argon, and XeCl excimer lasers yielded thrombogenic indices of 65-96, 85, and 66 percent, respectively. The reasons for the differences were not immediately apparent; however, it seems that additional studies are required to define laser angioplasty in order to preclude undue endothelial damage. Figures 3; references 14: 5 Russian, 9 Western.

UDC 617.723-006-085.849.19-036.8-07:617.735-091.8

#### **Retinal Changes Induced by Argon Laser Coagulation of Chorioid Tumors**

18400509c Moscow VESTNIK OFTALMOLOGII  
Vol 104 No 3, May-Jun 88 (manuscript received  
18 Sep 87) pp 54-59

[Article by A. V. Kaplina, candidate of medical sciences, N. V. Makarskaya and A. F. Brovkina, professor, Moscow Scientific Research Institute of Eye Diseases imeni Helmholtz]

[Abstract] An evaluation was conducted of the histopathologic sequelae of argon laser coagulation of chorioid melanomas. The laser therapy had been conducted with either Coherent Radiation (USA) or AK-1 (Finland) ophthalmic-coagulators under the following parameters: 0.5 sec exposure times and 550-900 mW outputs. The maximum tumor diameters for the different cases were in the range of 2.5 to 16 mm, with the enucleated eyes (27) studied 5-28 months after therapy—in one case 8 years—due to progression of the underlying tumor. The data showed that laser therapy resulted in extensive and severe retinal damage attributable mainly to injury to the central retinal artery and its branches. In addition, four cases sustained retinal detachment. The primary reason for the failure of laser therapy to effect a cure appeared to be inadequate laser coverage of the adjacent normal tissue. The failure to completely encircle a melanoma with scar tissue was further complicated in some cases by

the formation of dense scar tissue over the malignancy itself. The formation of a scar cover acted to shield the tumor from the laser and thus counteracted the effect of laser therapy. The final clinical impression was that the efficacy of laser treatment of chorioid melanomas might be improved by enlarging the area of the fundus oculi to be encompassed by laser treatment, particularly at the flattened edges of a melanoma. Figures 4; references 8: 3 Russian, 5 Western.

UDC 616.248-085.849.19.015.2-036.8

#### **Laser Therapy in Combined Treatment of Bronchial Asthma**

18400509d Moscow KLINICHESKAYA MEDITSINA  
in Russian Vol 66 No 6, Jun 88 (manuscript received  
29 Jul 85) pp 53-56

[Article by A. A. Khadartsev, V. A. Khoruzhaya and I. G. Danilyak, Tula Oblast Hospital]

[Abstract] Therapeutic trials were conducted to assess the effectiveness of incorporating low-intensity lasers (LG-75, 25 mW, 632.8 nm) in combined therapy of bronchial asthma. Two approaches were utilized: extracorporeal irradiation of 250 ml of autologous blood and reperfusion (Group 1), and laser treatment of bioactive points in the interscapular area with pressure on the points exerted by the fiberoptic to enhance greater penetration of the laser energy (Group 2). In the latter case an exposure time of 15-25 min was employed, with 2 repetitions if indicated, for a total of up to 10 procedures. The experimental groups consisted of a total of 249 patients, while control data were derived from 79 asthmatics managed in the conventional manner without laser intervention. Incorporation of the laser component led to superior therapeutic results in objective and subjective terms. The benefits of laser therapy were particularly noteworthy in the case of Group 1 patients, followed by Group 2 subjects, and then by the control patients in decreasing order of clinical benefit. In Group 1, 8.5 percent of the patients were taken off broncholytics entirely, and in 76.9 percent of Group 1 patients the glucocorticosteroid maintenance dose was reduced by more than 50 percent. Finally, in a significant percentage of Group 1 patients aerosol or long-acting parenteral glucocorticosteroids were found to provide the required maintenance. The data thus demonstrated the efficacy of extracorporeal laser irradiation of the autologous blood and reperfusion in the management of bronchial asthma. References 10: 7 Russian, 3 Western.

UDC 616.12-005.4-085.849.19-036.8-07:612.017.1

#### **Laser Therapy and Immune Function Indicators in Ischemic Heart Disease**

18400509e Moscow SOVETSKAYA MEDITSINA in  
Russian No 6, Jun 88 (manuscript received 27 May 87)  
pp 67-70

[Article by V. G. Ananchenko, T. V. Streltsova, N. A. Gryaznova, S. V. Kuznetsov, I. K. Malashenkova, R. M. Vakolyuk and O. Yu. Alisova, 2nd Chair of Internal Diseases, 2nd Therapeutic Faculty, 1st Moscow Medical Institute imeni I. M. Sechenov]

[Abstract] The demonstration that laser therapy is a viable therapeutic modality in heart disease led to a study of laser effects on the immune system in the course of laser treatment of ischemic heart disease (IHD). Furthermore, the relationship between cardiovascular pathology and immunological status has also been well established. Evaluation of the immune system was conducted on 21 patients with IHD (19 males, mean age 55.6 years) subjected to helium-neon laser therapy (LG-75 instrument;  $0.63 \mu\text{m}$ /  $0.5\text{-}0.6 \text{ mW/cm}^2$ ). The chest wall was treated for 1-2 min daily for a total of 7-14 procedures. The duration of IHD had been ascertained to range from 1 month to over 10 years with each patient reporting daily episodes of angina pectoris. Laser therapy, in combination with more conventional treatment efforts, resulted in an improved clinical status in every patient after the first few laser procedures. However, the improvements were most pronounced in patients with

IHD for 5 years or less. In addition, the patients showing the greater degree of improvement showed the greatest initial degree of T cell depression; the percentage of T cells was restored to essentially normal levels following laser therapy. There were no significant deviations in B cell levels prior to laser therapy, although afterwards both depressions and elevations were noted on an individual basis. In 4 patients with a moderate improvement the T cell levels were normal, while laser therapy was followed by pronounced depression. In addition, in the patients with marked improvement the IgA immunoglobulin fraction was depressed prior to laser therapy, a phenomenon reversed by laser treatment. These observations again confirmed a relationship between IHD and the immune status of the patients and demonstrated that patients with depressed levels of T cells are the ones most likely to show a pronounced benefit from laser therapy. References 7 (Russian).



### **Injectable Bacteriophage Preparation for Staphylococcal Infections**

18400007 Tbilisi ZARYA VOSTOKA in Russian  
20 Jul 88 p 4

[Article by Dzhilda Ivanishvili: "In the Family of Bacteriophages—An Addition..."]

[Abstract] Researchers under the direction of Corresponding Member of the GSSR Academy of Sciences Teymuraz Georgiyevich Chanishvili have developed an injectable bacteriophage preparation at the Tbilisi Scientific Research Institute of Vaccines and Serums. Clinical tests show the preparation to be selective for staphylococcus, a feature absent from all previous bacteriophage preparations developed at the institute. It is also the first i.v.-injectable bacteriophage preparation the institute has produced. The preparation is indicated for adults as well as children and is said to have no side effects if the dosing instructions are followed strictly.

### **New Artificial Ventilator Developed**

18400008 Moscow SOVETSKAYA ROSSIYA in Russian  
17 Aug 88 p 3

[Article by A. Pyatunin, Sovetskaya Rossiya correspondent: "Ventilator for...the Lungs"]

[Abstract] A multiyear effort by a design group headed by Corresponding Member of the USSR Academy of Sciences A. D. Konopatov has culminated in the development of the Faza-3S portable pulmonary ventilator at the Khimavtomatika enterprise. The ventilator—prototypes of which have been in use for a year and a half at the Voronezh Oblast Childrens Clinical Hospital—has passed clinical tests at the All Union Scientific Center for Surgery of the USSR Academy of Medical Sciences and has been placed into series production. Unlike all other such units, the Faza-3S need not be disassembled for its respiratory circuit to be sterilized. The unit weighs 15 kilograms (other domestic ventilators weigh more than 100) and has a visual/audible alarm system that signals a loss of seal in the respiratory circuit. At 3,000 rubles, the Faza-3S is considerably less expensive than imported ventilators, which cost \$10,000-15,000. Some 300 units have been produced, but manufacturers are said to be capable of expanding production by several times that amount. Pulmonary ventilators are used in intensive care units and in space medicine.

### **Soviet Heart Surgeons Perform Unique Heart Operation**

18400011 Moscow ADVANCES OF SCIENCE AND TECHNOLOGY in English No 18, 25 Jun 88 pp 1-4

[Article by Antanas Ragaisis]

[Text] An operation was carried out on May 23 at the Kaunas Medical Institute (Lithuanian SSR) to implant in a patient a permanent "helper" for his heart, a "living pump" made from the broadest muscle of his own back

and a special electronic stimulator. The operation was carried out by Professor Arimantas Dumcius, head of the Cardiovascular Surgery Laboratory at the Kaunas institute. The Novosti correspondent has asked him to reply to the following questions:

Question: What has necessitated the operation?

Answer: Before the operation, Vasily Fokin, 58, from the Lithuanian town of Klaipeda, was in a critical condition. He had suffered for many years from dilatation ischemic cardiomyopathy, when the worn-out cardiac muscle can no longer ensure the normal functioning of the heart. Until now the only thing that could save a patient having this disease was a heart transplant. We have implanted a second heart to the patient, a kind of "living pump" which is capable of compensating for the defects of his own heart. We made the pump out of a flap of the broadest muscle of the patient's back and an electronic neuromyostimulator. Today, the patient is already walking and feels considerably better than he did before the operation. He no longer suffers from dyspnea and his legs no longer swell.

Question: Why did you follow this road in solving the problem?

Answer: We divide patients with serious heart diseases roughly into two groups: some that can be saved by an operation on the heart, and the others, whom only a transplant can help. It often happens that the heart does not function sufficiently well after a vast myocardial infarction or a disease of the cardiac muscle. Heart specialists are unable to help patients having a serious defect of the ventricle, when it is impossible to replace its thinned wall or tissue damaged by a vast infarction. Now we know two ways out of such situations: either to transplant a donor heart or implant an artificial (mechanical) heart. I regret to say that neither have as yet yielded good long-term results. Transplantation involves the difficulty of finding a donor, and there are also some unsolved immunological problems. With mechanical heart implantation, there is always the danger of thrombi forming in the blood. That is why we were naturally attracted by the idea of building a "living pump" that would make up for the patient's own damaged heart.

This idea is not new. The associates of the Kaunas Medical Institute and the USSR Center for the Surgical Treatment of Complicated Cardiac Rhythm Defects and Electrocardiostimulation are familiar with an operation involving the building of a second heart that was carried out by the surgeons of the Pennsylvania University (USA) jointly with colleagues from Britain, France, and Sweden. We found this new method interesting and began to experiment.

Question: In what way are your experiments unique?

Answer: Technically, it is now easier to make a heart graft than, say, to replace a worn-out muscle in a myocardial infarction case. And nevertheless, if there is the slightest chance to preserve the patient's own heart in a critical situation, we do our best to use that chance. We have built original electrodes and external electroneurostimulators. We used experimental animals to train the broadest muscle of the back with the help of electrical parameters. We folded it to form a bag, attached vessels to it and, exciting it through a live nerve, forced it to contract rhythmically. By applying special electrical impulses and gradually increasing their frequency, we have managed to attain a training effect that in some ways resembles an athlete's superloads. We attached the device to the heart. We have done such operations on eight dogs, and all went successfully. The animals were under observation for 9 months. Most of them lived with an additionally strengthened heart—a muscle flap that was trained from outside until we managed to solve the important problem of teaching the live pump to work synchronously with the heart. We implanted in the dogs a neurostimulator run by the heart itself.

The new method of overcoming fatal cardiac insufficiency with the help of an additional heart built from the patient's own muscle is not plagued by many of the drawbacks that are unavoidable in implants. Above all, it solves the problem of rejection and also that of obtaining a donor heart. The "living pump" does not tie the patient to some external device.

A few weeks before the operation we trained the patient's broadest back muscle. We implanted a stimulator and, programming it from the outside, gradually increased the

electrostimulation load. The muscle got used to continuous work and to its new functions. Experiments carried out at our institute and at the Bakulev Research Institute of Cardiovascular Surgery in Moscow show that the principle of the work of a trained back muscle is similar to the heart's action.

Question: Who helps you to solve these complicated problems?

The training effect is studied not only by heart surgeons, but also by specialists in biomechanics, bio- and histochemistry of the Kaunas Medical Institute and our center. Unique stimulators for muscle training were developed together with the Moscow Design Bureau of Precise Machine Building. Our associates and engineers have designed implantable stimulators and special electrical transducers. We are now working jointly on a fully automated implantation system.

Here is the brief comment of prominent heart surgeon, Yurgis Bredikis, member of the Academy of Medical Sciences of the USSR, head of the Kaunas cardiology center:

"Patients can live normally with such an additional heart. 'The 'living pump' can help to make up for some defects of the patient's heart, and cure others. The heart, once relieved of excessive loads, is capable of restoring some diseased tissues and functions by itself. True, there are still many unsolved problems in this field, but the results of the mentioned operation hold much promise."

UDC 620.193.82:582.28

**Effects of Dichloromaleic Acid Derivative on Fungi Involved in Biodegradation**

18400498b Leningrad MIKOLOGIYA I  
FITOPATOLOGIYA in Russian Vol 22 No 2,  
Mar-Apr 88 (manuscript received 18 Oct 86) pp 146-149

[Article by N. A. Zaikina, N. V. Razukrantova and Ye. V. Khoroshiltseva, Leningrad Institute of Pharmaceutical Chemistry]

[Abstract] Trials were conducted with agent 241, a derivative of dichloromaleic acid shown to possess fungistatic activity, as a promising agent for the control of fungi involved in biodegradation. Testing on nine genera of fungi by serial dilution showed that the fungistatic activity ranged from 0.1 to 100 µg/ml. Mycelial uptake of the volatile preparation was found to be directly related to fungal susceptibility to 241-mediated stasis. After 1 h of exposure to 241 vapor, the more susceptible *Penicillium cyclopium* 17 (10 µg/ml for fungistatic effect) absorbed 6.6 µg/10 mg mycelium, while the more resistant *Aspergillus niger* 2 (100 µg/ml for fungistasis) failed to absorb any of the compound. Studies of membrane permeability showed that 241 leads to disorganization of the fungal cell membranes and causes leakage of cytoplasm. These findings indicate that 241 appears to be a promising congener of dichloromaleic acid for control of fungi responsible for biodegradation of various materials. The mechanism of action of this lipophilic agent involves absorption by mycelia and disruption of the cell membranes. References 3 (Russian).

UDC 582.288.45:577.17

**Formation of Growth Regulators by Phytopathogenic Fungus *Monilia sitophila***

18400498d Leningrad MIKOLOGIYA I  
FITOPATOLOGIYA in Russian Vol 22 No 2,  
Mar-Apr 88 (manuscript received 27 Jan 87) pp 168-175

[Article by V. P. Murygina, M. U. Arinbasarov, A. G. Kozlovskiy and N. M. Gerasimova, All-Union Scientific Research Institute of Applied Molecular Biology and Genetics, Moscow; Institute of Biochemistry and Physiology of Microorganisms, USSR Academy of Sciences, Pushchino]

[Abstract] Extensive screening studies were conducted on phytopathogenic fungi isolated from various plants in an attempt to isolate a fungal strain producing growth regulators. A plant growth regulator was eventually fractionated from the cultures of *Monilia sitophila* that had been isolated from orange leaves. Production of the

growth regulator was highly variable, eventually leading to the identification of a high producer designated M. sitophila 26-4-11. Tests on Mironovskaya 808 wheat showed retardation of the second internode by 64-86 percent with three fractions (A, B, or C) in concentrations of 5 to 50 mg/liter. None of the fractions possessed antibiotic activity when tested on bacteria, yeasts, or molds. Figures 2; references 14: 6 Russian, 8 Western.

UDC 614.449.57:579.843.95:591.617.582.282.123.2

**Effects of Entomopathogenic Fungus *Penicillium funiculosum* on Multiplication of Plague Bacillus in Fleas**

18400514b Moscow MEDITSINSKAYA  
PARAZITOLOGIYA I PARAZITARNYYE BOLEZNI  
in Russian No 3, May-Jun 88 (manuscript received  
11 May 87) pp 28-29

[Article by N. V. Lopatina, B. P. Tsybin, L. V. Bryukhanov, Ye. A. Lunina and S. P. Osipova, Scientific Research Antiplague Institute, USSR Ministry of Health, Rostov-on-Don; Scientific Research Antiplague Institute of the Caucasus and Transcaucasus, USSR Ministry of Health, Stavropol]

[Abstract] The involvement of the entomopathogenic fungus *Penicillium funiculosum* in the process of flea (*Xenopsylla skrjabini*) infection with *Yersinia pestis* No 461 was studied in order to define the potential role of the fungus in plague transmission. The importance of *P. funiculosum* was based on its regular isolation from gopher burrows. Fleas exposed to *P. funiculosum* conidia and then fed on dying mice infected with *Y. pestis* showed an infectivity rate of 90 percent, versus a 40 percent infectivity rate for control fleas. The infectivity rate for fleas that were initially fed on the infected mice and then treated with the conidia was 50 percent. The increased infectivity of fleas exposed to the fungus was attributed to *P. funiculosum*-mediated depression of flea resistance to the plague bacillus. However, 12 days after infection, the concentration of *Y. pestis* cells in *P. funiculosum*-infected fleas was 25 to 33-fold lower than in the control fleas. The latter difference was attributed to antibiotic production by *P. funiculosum* which favored more rapid clearing of the bacilli from the fleas. The presence of the *P. funiculosum* conidia also diminished the incidence of pharyngeal blockage in the fleas that were first infected with *Y. pestis* and then treated with the fungus to 6.8 percent from a control value of 10 percent, while the incidence in fleas treated with *P. funiculosum* and then infected with *Y. pestis* was 0.7 percent. These findings suggest that incorporation of antibiotic-producing strains of *P. funiculosum* into biological insecticides may both decrease the numbers of flea vectors and diminish their epidemiologic threat. References 6: 5 Russian, 1 Western.

UDC 582.288.45:576.8.097.29

**Temperature Factors in Toxin T-2 Production by  
*Fusarium Sporotrichiella* on Millet**

18400498a Leningrad MIKOLOGIYA I

FITOPATOLOGIYA in Russian Vol 22 No 2,

Mar-Apr 88 (manuscript received 13 May 87)

pp 123-126

[Article by E. V. Boltyanskaya and Ye. A. Kroyakova,  
Institute of Nutrition, Moscow]

[Abstract] An analysis was conducted on the levels of mycotoxin T-2 production by *Fusarium sporotrichiella* 53315 grown on sterile millet in relation to temperature conditions. The levels of T-2 in grain extracts were determined by using *Saccharomyces lactis* VKMU-459 as the test organism. Cultures of *F. sporotrichiella* grown at 18°C showed trace quantities of T-2 on day 3, reaching a maximum concentration of 104.0 to 166.7 µg/g grain on day 7. Thereafter T-2 levels declined to 67.0 to 100.0

µg/g by day 21. Cultures maintained at 27°C first displayed trace quantities of T-2 on day 4 (1.6 to 2.0 µg/g), reaching a maximum (14.3 to 41.7 µg/g) on day 7, and thereafter declining to 2.8 to 4 µg/g by day 14 and virtually disappearing by day 21. The production of T-2 rose sharply when the temperature of cultivation was dropped to 5°C after 7 days at 18°C: on day 14 the levels of T-2 rose to 500 µg/g, and on day 21 to 833 to 1250 µg/g. Reducing the temperature to 5°C after 7 days of cultivation at 27°C was not accompanied by enhanced biosynthesis of T-2: the levels detected on days 14 and 21 were in the 2.0 to 2.7 µg/g range. These observations explain the fact that high concentrations of the mycotoxin T-2 are encountered in the case of grain harvested late in the season or subjected to overwintering in the field. The data were interpreted to indicate that at 18°C, but not at 27°C, enzymes were synthesized that are responsible for the production of T-2. However, activation of these enzymes requires lower temperatures on the order of 5°C for optimum production of this secondary metabolite. References 6: 5 Russian, 1 Western.



### Spectral Sensitivity of Human Eye

18400415d Moscow DOKLADY AKADEMII NAUK  
SSSR in Russian Vol 300 No 2, May 88 (manuscript  
received 22 Jul 87) pp 504-507

[Article by Yu. P. Chukova]

[Abstract] The article described an attempt to show that long and reliably established characteristics of the process of human vision are in strict conformity with thermodynamic limitations given by the Landau-Weinstein method for endoergic processes that occur with exposure to visible and infrared light. It is common knowledge that the vision process is based on the endoergic process of isomerization of light-sensitive pigment, which requires nearly 25 kcal/mole of energy. Use of the Landau-Weinstein method made it easy to explain one of the newest effects of vision, observed during study of perception of polarized and nonpolarized light by the eye. The effect is called the Feynberg phenomenon, after the discoverer of the higher sensitivity of the human eye to polarized light. The efficiency of the endoergic process that takes place with exposure to polarized and nonpolarized light with wavelength 780 nm was illustrated and discussed. Alteration of a single parameter (polarization) changed efficiency by a large amount. The transition from nonpolarized light to polarized light heightens the sensitivity of the eye by many orders of magnitude. Figures 2; references 13: 10 Russian; 3 Western.

### Synaptic Effects of Nicotinic and Muscarinic Agonists in Frog Sympathetic Ganglia

18400471 Kiev NEYROFIZIOLOGIYA in Russian  
Vol 20 No 2, Mar-Apr 88 (manuscript received  
26 Mar 87) pp 227-234

[Article by V. Yu. Bolshakov and N. Ya. Lukomskaya,  
Institute of Evolutionary Physiology and Biochemistry,  
USSR Academy of Sciences, Leningrad]

[Abstract] The fact that there are both nicotinic and muscarinic choline receptors on the postsynaptic membrane of sympathetic ganglia neurons prompted this study of the synaptic consequences of selective activation of nicotinic and muscarinic receptors of ganglionic neurons and the variation in their functional properties under prolonged effect of these agonists. Experiments were performed on isolated IX-X ganglia of the truncus sympathicus of the frog *Rana temporaria*. Superfusion of the ganglia with nicotinic agonists (suberyldicholine, tetramethylammonium, dimethylphenylpiperazine), as well as acetylcholine in the presence of atropine, produced short-term depolarization of the neurons and synaptic transmission block. Muscarinic agonists methylfurmethide and methyldivlasen as well as acetylcholine produced persistent depolarization without transmission impairment. Oxotremorine in concentrations of  $1 \times 10^{-5}$  M did not depolarize the postsynaptic membrane, but a  $1 \times 10^{-4}$  M concentration produced almost a two-fold decrease of the EPSP quantum composition, identifying the presynaptic potentials as an  $M_2$  type. Inhibition of acetylcholinesterase greatly intensified the postsynaptic methylfurmethide effect with a shift of the concentration-effect curve in the direction of lesser concentrations of methylfurmethide. Postsynaptic muscarinic receptors displayed different sensitivity to methyldivlasen enantiomers and are stereospecific. The findings explain changes of synaptic transmission with the prolonged presence of the mediator in the synaptic cleft. The study demonstrated, for the first time, that postsynaptic muscarinic receptors of frog sympathetic ganglia belong to subtype  $M_1$ , are highly stereospecific and do not differ, in this respect, from peripheral muscarinic receptors of the frog and other vertebrates. Figures 6; references 18: 5 Russian; 13 Western.

**Advantages of Pay Hospitals Discussed**  
18400004 Moscow SOVETSKAYA ROSSIYA in  
Russian 30 Jul 88 p 4

[Interview by SOVETSKAYA ROSSIYA correspondent with M. M. Zhukova, chief physician of the Lecheniye i konsultatsiya cooperative's hospital and a candidate of medical sciences; V. L. Glants, deputy chairman of the cooperative for therapy; and V. S. Voronchenko, chairman of the cooperative: "Professor of Choice"; passages in boldface as published]

[Text] After the publication of the article "Charity on Cost Accounting" (SOVETSKAYA ROSSIYA, 13 April 1988) on the first pay hospital in the country, the editor got hundreds of letters. Many readers supported the idea of creating a cost-accounting clinic that would make it possible to increase the volume of services available to the public; others expressed doubts, feeling that this could divert medical personnel from state-supported medicine; still others directed their attention to questions of social justice: would such treatment be within the "pocketbook" of the individual with a low salary? Despite the differing opinions, all the letter writers agreed about one thing—the discussion of medicine-for-pay must continue. Specifically, it was suggested that we again visit the clinic on Entuziastov Highway.

And here we are, in the homeopathic hospital. And we arrived, as it turns out, at just the right time. The status of the hospital has completely changed since the first of August of this year; it is now part of a cooperative. Such a turn of events requires some commentary. For that reason, we give the floor to the chief physician of the hospital, **Candidate of Medical Sciences M. M. Zhukova** (who is also now, it can be added, the deputy chairperson of the cooperative *Lecheniye i konsultatsiya* [Treatment and Consultation] for homeopathy):

"Why did the hospital become part of a cooperative? Life itself brought this about. Let's look at the economic totals for the first six months. As you know, our homeopathic hospital is affiliated with a homeopathic polyclinic. And in spite of the fact that the physicians work hard in both places, the polyclinic still produces 60 percent of the profits. But as far as outlays go, the hospital accounts for the greater share (nearly two-thirds). This imbalance led to our barely being able to make ends meet, even after we surpassed by 43,000 rubles the plans established for us for rendering fee-based care to the public. We absorbed all the costs for hospital maintenance. In that situation, the simplest road to take would be to abandon the hospital and limit our activity to the polyclinic. But that would inconvenience thousands of patients.

"The economists suggested a way out. According to their analysis, the cause of many of our ills is the petty guardianship of the Administration for Cost-Accounting Treatment Institutions. Without the administration, we can't change staff schedules or department structures

and we can't purchase medical equipment expeditiously. Suppose the list of people who need to be hospitalized in the gynecology department grows large, while the therapy department is empty. It would seem sensible to restructure the department and recruit new specialists. Everybody would win—the people and the Moscow city ispolkom's budget. But no, the regulations forbid that. Or take, for example, the problem of nutrition. We've tried everything! But come spring and summer, and we still don't have any vegetables or fruit. But how on earth can a hospital be without them? We're the only hospital in the country where people who come to visit a patient bring two bags of groceries with them from the market. The hospital itself cannot conclude an agreement with either the co-operators or those same markets."

The chairman of the cooperative "*Lecheniye i konsultatsiya*," V. S. Voronchenko, enters the conversation: "I feel that we need to completely reexamine our views on fee-based health care. As it turns out, we have transferred all the deficiencies of conventional medicine's administrative management to it. The very same circulars, the very same standards, the very same slowness in reaching a decision. But that's not acceptable. People pay for the treatment, so they rightly expect special attention from the physicians.

"The cooperative movement is opening new horizons. The cooperative *Lecheniye i konsultatsiya*, for example, appeared less than a year ago, and nearly one-hundred thousand people have already turned to it for its services during that time. And what is especially gratifying is that the new undertaking has been supported by the city's residents as well as by the Main Administration for Health Care of the Moscow city ispolkom. For the first time in many years, perhaps, the health care sector has people who are concerned more about the actual health of the population than about indicators that don't reflect anything. For that reason, when it became clear that the new status of the homeopathic hospital would raise the quality of the medical care and make physicians' efforts more effective, the Main Administration for Health Care adopted a supporting resolution."

A. Nemoev: Can you tell us in more detail what will change in the hospital?

M. M. Zhukova: "We will be able to render medical care to a broader category of patients. We are opening a surgical department. It will perform operations associated with varicose veins. The treatment will involve several stages. First, we'll conduct homeopathic treatment, and only after that will we perform an operation. In our view, that kind of a combination of different methods will produce the best results. For that reason, we will supplement homeopathic treatment of bronchial asthma, trophic ulcers, allergies, and rheumatic arthritis with extracorporeal clearance of the blood. This method of blood clearance is now widely used in medicine. It is simple and effective. A catheter is inserted into the patient's vein, and the blood is directed through a special

filter that removes harmful biological components. We have enlisted leading specialists from the Institute of Transplantology and Artificial Organs of the USSR Ministry of Health to perform the treatment.

"The gynecology department of the hospital, which is involved primarily with the treatment of infertility, will get expensive, more modern equipment. Before, we never even dreamed of such a thing. We have laparoscopy equipment. Several clinics in the capital have such equipment, but we will use it more effectively, on two shifts if necessary.

"I can name a few other areas the hospital will work in—we'll have a neurology department, an orthopedics department, and a cosmetic surgery department, where braces can be fitted, wrinkles can be removed, and the skin can be reconditioned."

**Deputy chairman of the cooperative for therapy V. L. Glants:** "Changing a hospital over to the cooperative track not only expands the range of treatment and enables the acquisition of state-of-the-art equipment, it also radically changes the criterion for selecting medical staff members. It was mentioned that for extracorporeal blood clearance we are enlisting specialists from the Institute of Transplantology. Why? Because that's the leading center in the country for that method. Or take varicose veins. The operations will be performed by the leading medical people from the Scientific Research Institute of Emergency Care imeni N. Sklifosovskiy and the All Union Scientific Center for Surgery of the USSR Academy of Medical Sciences. Furthermore, the patients at our hospital will be able to choose the surgeon they want for the surgery."

**A. Nemov:** But won't it turn out that your cooperative will divert all the very best medical people away from the state health care sector?

**V. L. Glants:** "Right after the *Lecheniye i konsultatsiya* cooperative was created, the Main Administration for Health Care put a task before the cooperative—that it *not divert* the leading medical personnel from the city's clinics, but, just the opposite, that it foster a fuller use of the talent and skills of the physicians. Let's say that right now the cooperative has about 300 medical personnel. Almost all of them are candidates or doctors of medical science. But they will see patients and perform operations in the cooperative in their spare time only. Who comes out ahead if these first-class physicians devote their free time just to leisure?"

**A. Nemov:** But a person can save his skills and talent for the cooperative and merely "serve his time" at his main job. Who's to say that won't happen? That's something that disturbs many of our readers.

**M. M. Zhukova:** "If you look at it that way, you're assuming that the physician is merely a self-seeker and comes to the cooperative just for money. Certainly a

raise in salary won't hurt anyone. But in the cooperative many medical people receive the independence and the opportunities they need to do whatever it takes to deal with a patient properly. As far as homeopathy goes, the cooperative is devoting considerable means to scientific research, to the conduct of conferences and symposia, and to the publication of scientific papers. That is extremely important. Right now researchers in the leading countries are witnessing a revolution in the concept of the mechanism of the effect of small doses of drugs on the human body. Unfortunately, the financial resources of the Ministry of Health and the Academy of Medical Sciences are not so great. For that reason, the attraction to financing a cooperative offers assistance to scientific investigation. But let's get back to our question. A mechanism for protecting the interests of the patient has been developed. If it turns out that some physician is not performing his duties at his main job, the cooperative will part with him. We have a lot of people to choose from. Right now, there are more medical personnel who want to work with the cooperative than we need. We will choose a number of specialists for the hospital, for example, on a competitive basis."

**A. Nemov:** What will the costs be like in the hospital?

**V. S. Voronchenko:** "A course of homeopathic treatment for the diseases we discussed will cost the patient 180-220 rubles. That, of course, includes costs for both food and visits to the clinic. Varicose vein surgery (and a number of other surgeries), with all the accompanying treatment and services, will cost 350-400 rubles. These are economists' figures, based on the prevailing norms. That fee may be substantial for some; but after all, in addition to first-class medical care, we also guarantee comfortable conditions during one's stay in the hospital. In the previous publication, you explained that the wards here are only two-person rooms, with all the conveniences. And now we've installed a telephone in each room. The meals are prepared by the cooperative's special cafe, and patients can order what they want.

"I would like to emphasize again: the cooperative hospital is not a subversion of the state health care sector, but a necessary supplement. We are ready to look at any suggestions on how to make the operation of the cooperative more efficient and accessible to everyone."

**A. Nemov:** It would probably be good to mention the address of the clinic.

**M. M. Zhukova:** Moscow, Entuziastov Highway, Building No 62. For information, call 305-11-72.

UDC 616-058+312.1(575.4)

### **Socio-Hygienic Birth Characteristics in Young Turkmen Families**

18400485 Ashkhabad ZDRAVOOKHRANENIYE TURKMENISTANA in Russian No 3, Mar 88 pp 5-10

[Article by I. P. Katkova and A. A. Nazarova, Moscow Medical Institute No 1 imeni I. M. Sechenov, Moscow]

[Text] The "Basic Guidelines for Economic and Social Development of the USSR for 1986-1990 and the Period Up to the Year 2000" emphasizes the importance of



implementing demographic policies which take into account the specific characteristics of various regions of the country.

This formulation of the question proceeds from the demographic situation currently existing in the country, which is one of significant differentiation and contrast among individual union republics and the major socio-economic regions, which should also predetermine the approaches to the specific measures of the demographic policies.

It is well known that the demographic processes in the republics of Central Asia are having a large effect on the important health indicators of the country's population. It should be expected that in the coming years it will be even more significant, since according to demographers' prognoses for the year 2000 the Central Asian republics will account for 40 percent of the entire population increase in the country and more than half of the increase of able-bodied population in the USSR. The existence of multi-child families in the Central Asian region at this time plays a positive role in compensating for a birth rate that is too low in most of the country, and thanks to that, expanded reproduction is maintained as a whole, since simple replacement of the generations is assured only by the birth of the fifth and sixth children.<sup>1,7</sup>

This situation makes necessary an intensive study of the socio-hygienic problems of health and reproduction of the population of Central Asia and an understanding of the essence of the process of the formation of multi-child families, based on an analysis of the rates of formation of young families, since it is they who most fully absorb all existing achievements of the socio-economic development of the region and therefore reflect the prospects for developing birth-rate processes in the republics.

The statistical breakdown, by union republic, of married women according to number of children they have given birth to shows a sharp increase in the number of women per 1,000 between the ages of 18 and 59 who have given birth to six or more children in the republics of Central Asia: in the Kirghiz SSR, 150 per thousand; in the Uzbek SSR, 206; in the Turkmen SSR, 220; and in the Tajik SSR, 240.<sup>2</sup>

Analysis of the statistical data on number of children expected among married women of indigenous nationality per 1,000 women between the ages of 18 and 44 also indicates that the majority of them expect to bear six or more children: Kirghiz women, 430 per thousand; Uzbek women, 437; Tajik women, 510, and Turkmen women, 563.<sup>2</sup>

Along with a high level of reproduction, high infant mortality is characteristic of the republics of Central Asia; moreover, while this indicator decreased between 1970 and 1986 from 45.4 per thousand to 38.2 per

thousand in the Kirghiz SSR, it increased in the Turkmen SSR from 46.1 per thousand to 58.2 per thousand during this same period. During 1985-1986, infant mortality in Turkmenia was the highest both throughout the entire country and among the Central Asian republics.

The existing ethnic features of the lifestyle of Turkmen families (traditions, rites, and customs) require that we search out and develop new methodological approaches to studying the medical and social features of the formation of young families.

In order to identify the features of the rates of formation of today's young Turkmen families, we conducted a study in 1984-1986 of a cohort of 660 families residing in Ashkhabad. The cohort method made it possible to conduct an in-depth analysis of many indicators, with a substantially reduced number of observations.

The cohort was based on the following demographic indicators: all were wedded during same year (between 1 January and 31 December 1978); each spouse was of the Turkmen nationality; the marriage was the first for each spouse; all had been residing in Ashkhabad since the wedding.

The program of the study included a survey of the women in their homes, with a specially designed questionnaire; information needed about their spouses and their children was copied from the official data at the Registry Office, and information about the morbidity, health screenings, and prophylactic treatment of the children in the study was taken from the medical records of nine children's departments of the polyclinics of three rayons of Ashkhabad.

It is now recognized that one of the most important characteristics that integrates changes that are beginning in demographic behavior is an increase in number of marriages.

Early marriages have for a long time predetermined to a significant degree the ethnic features of the development of demographic processes in the republics of Central Asia.

Marriage in this country is undergoing a process of rejuvenation that is characterized by women entering into their first marriage earlier. But contradictory trends in this process are developing among women of various nationalities. In the union republics of the European part of the USSR, where the proportion of early marriages was for a long time relatively low, an increase in such marriages is now clearly seen. At the same time, among the peoples of the Central Asian region, for whom a fairly high proportion of early marriages is typical, the percentage of early marriages decreased considerably between 1950 and 1975; the figure dropped by some 28 percent among Turkmen women, a larger drop than among Tajik, Uzbek and Kirghiz women.<sup>3</sup>



In connection with this, it is interesting to note that at present the number of births per 1,000 women under the age of 20 for the 1984-1985 period in the Turkmen SSR is the lowest among all the Central Asian republics, amounting to 20.1; that statistic is 35.1-39.0 in the rest of the republics, and 43.2 in the USSR as a whole.

Analysis of the distribution of the families according to the age of the women when they got married yielded the following results: 40.9 percent of the women entered early marriages, with 52.7 percent of the young Turkmen women we studied entering marriage at the optimum age (20-24) for creating a family and bearing children—that is, when the social maturity of the spouses approaches their physiological maturity, which predetermines the future vitality of the family and its ability to give birth to, bring up, and protect the health of the children.

The rapid building of a family during the first years of married life is a distinguishing characteristic of the demographic development of the Central Asian region, evidence for which is the data in our study indicating that only 3.2 percent of the spouses had no children at the time of the study (2.4 percent primary and 0.8 percent secondary infertility), 9.1 percent of the families had one child, 34.1 percent had two children, 32.6 percent had three, 17.4 percent had four, and 3.6 percent had five or six.

With the birth rate beginning to drop in the region, families with one and two children are of special interest. From the demographic point of view it is important to find out whether this is the result of conscious regulation of child-bearing, whether it represents internal family planning of the number of children they will have, or whether these families are one- or two-child families at the time of the study as a consequence of a number of factors, in particular the death of children.

According to the data analyzed, 18.9 percent of the total number of families studied had had children who had died: 15.9 had had one child who had died; 2.1 percent, two; 0.6 percent, three; and 0.3 percent, four. It should be noted that 90.4 percent of the families who had lost four children right away had one living child at the time of the study, while 9.6 percent of these families had no children. The percentage of children who had died during the married lives of the young Turkmen families amounted to 23.2. The highest number of dead children (31.6 percent) was observed in single-child families, with the highest number of dead children in families having five children equal to 14.4 percent.

Among the families studied, regardless of the number of living children at the time of the study, families in which the first-born child had died constituted the largest percentage (9.7 percent). Of these, in 45.3 percent of the cases, the women had married before the age of 20, and in 1.6 percent, after the age of 30; every other couple (54.7 percent) had no secondary education; in 67.2 percent of the cases the women were housewives; 20

percent of the families lived in the least favorable housing and economic conditions for creating a family, while almost 30 percent lived in conditions that were satisfactory.

The level of education of the couple at the time of the marriage predetermines the subsequent rate at which they build a family<sup>4</sup>; in particular, a higher level of education tends to have a moderating influence on the the process of procreation. Of the total number of Turkmen families studied, both spouses had a secondary or an incomplete general education at the time of marriage in 47.9 percent of the cases, and only 15.4 percent of the spouses had had a higher education, an unfinished higher education, or a secondary specialized education; 61.8 percent of the latter had two children at the time of the study, while 60.2 percent of the couples with a basically low level of education were raising three to four children.

The level of employment in industry of Turkmen women in the republic is still low. Women account for the majority of the unemployed population, the reasons for which are the multi-child family, which in essence ties the woman to domestic concerns, and the relatively low level of education and professional training. The data obtained from studying the employment level of women during the years of marriage confirm that fact: 53.9 percent of the women studied were housewives. A study of the effect a woman's age when the family is being created has on her subsequent occupation enables us to say that women who get married after the age of 20 are more frequently employed in social production (37.7 percent) than those who get married earlier (24.8 percent). Nevertheless, it must be noted that regardless of the age at marriage, a very high percentage of women in both the former and the latter age groups are housewives—50.0 percent and 59.6 percent, respectively.

According to the data analyzed, every other working woman had two children, and, in connection with this, the number of two-child women among housewives is more than twice as small (23 percent). In the majority of cases, the housewives had three or four children at the time of the study. Sixty-five percent of the young families had lived in mixed families (several married couples of different generations living together with and without children). Young couples living together with the older generation tends to slow the entry of modern views on medical treatment and on the quality of care for a child into the family.

Taking into account the ethnic features of the lifestyles of Turkmen families, we worked out a new methodology for assessing the quality of maternal care given to a child in the first year of life. For example, along with generally accepted criteria of the quality of care (timely introduction of solid food and natural and antirachitic preparations, daily exercise, and proper care for the baby's skin), we separated them into groups according to duration of breast feeding and the observation of sanitary-hygienic

requirements when doing so, the time interval between discharge from the maternity home and the first bath of the newborn, and the sanitary-hygienic characteristics of the bath, the age at first feeding of solid food, and the nature of the food.

At this time it is worthwhile to note that the group of children who have the lowest level of care during the first year of life includes children who were bathed for the first time more than 15 days after being discharged from the maternity home, and moreover, when bathed, ingredients such as grain, twigs, eggshells, bits of meat, and coins were added to the water. In addition, these children were given solid food late, and food for which they were not ready, taking into account their age characteristics; as a rule, a child would begin to eat from the family table at 7-8 months. This approach to questions of the quality of maternal care made it possible to discover that approximately 60 percent of the families had various combinations of the above-noted negative factors in raising and caring for an infant child.

In assuring the success of the family's health functions, one of the most important roles applies to the living conditions of the family—that is, to the presence of completely satisfactory or good housing and economic conditions. Let us note that the analysis we conducted of the dynamics of housing and economic conditions during the period of married life showed that the number of families with the most favorable housing and economic conditions was reduced by more than half (from 6.1 percent at the time of marriage to 3.5 percent at the time of the study) and the proportion of families living under the least favorable conditions increased (from 15.7 to 38.9 percent). The distribution of families of this cohort with poor or least favorable housing and economic conditions at the time of the survey showed that in these families, in general, the couples with a low level of education and the women who were housewives lived, as a rule, in the combined families. In precisely these families, as a result of the inadequacy of sanitary-hygienic knowledge and skills in caring for an infant, there were 6 times as many cases of infant death in the first year of life than in families which were living in the most favorable housing and economic conditions at the time of the study (24.5 and 4.3 percent, respectively).

An analysis of the reproductive function indices of the women is of definite interest in studying the characteristics of the rates of formation of Turkmen families: each woman in our cohort during the period of married life had an average of 3.1 pregnancies, 2.9 births, 0.1 abortions, and 0.1 spontaneous miscarriages.

In general, the women had between two and four pregnancies and births, while 1.23 percent of them had five or more. In an analysis of the frequency of the reproduction function indices of the Turkmen women, one's

attention is drawn to the fact that the one- and two-child families have the greatest percentage of women who have artificially terminated a pregnancy (13.3 and 18.7 percent, respectively).

The frequency of spontaneous miscarriages and stillbirths is highest among women with two children (17.3 and 4.4 percent), while among the women with five and six children, not a single pregnancy was terminated by miscarriage or resulted in the birth of a stillborn infant.

In terms of methods of regulating reproduction in Turkmen families, the use of contraceptive methods and devices is considerably greater than the frequency of abortions (3:1).

Our analysis indicates that of the total number of married couples, 29.8 percent have used methods and devices of contraception. The structure of the use of contraceptive devices by couples is as follows: 89.9 percent have used intrauterine devices (IUDs); 8.1 percent have used mechanical devices (condoms, diaphragms, douching); 1.5 percent used the rhythm method by the calendar, and 0.5 percent used coitus interruptus. It must be noted that not a single couple used oral (hormonal) contraception. A structure with a clear predominance of the use of IUDs may be considered optimum from the medical point of view. Highly effective and practically harmless for the health of the couple, IUDs can be the method of mass contraception, and along with this, wide use of them makes it possible to discover and treat a number of diseases of the female reproductive system.<sup>5,6</sup>

Family planning of births clearly predominates among spouses who have a high educational level (68.6 percent) and who live in nuclear families (40.7 percent).

Women's employment in social production also has a definite influence on the contraceptive behavior of couples: women who are employed full-time in social production use contraceptive methods and devices almost 3.5 times more frequently than do housewives.

The survey of the women made it possible to establish the effect of existing children (the actual number of children at the time of the study) and contraceptive practices on the subsequent reproductive plans of the women. For example, 14.8 percent of the studied families who were using contraceptive methods still planned to have more children, while 44.4 percent of the families not using contraceptive devices felt that their families were not yet complete.

Thus, the above-mentioned characteristics of the medical-demographic structure of modern young Turkmen families have great significance for developing demographic policies which more fully take into account the regional characteristics of the demographic development of the country.

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**Fund for Health and Charity Established**  
18400010 Moscow IZVESTIYA in Russian  
17 Sep 88 p 2

[Article by TASS: "Charity Fund"]

[Abstract] The creation of the Soviet Fund for Health and Charity was the purpose of an all union founding conference that took place 16 September 1988 in Moscow. The conference was attended by representatives of the Alliance of the Societies of the Red Cross and the Red Crescent of the USSR, the All Union Central Council of Trade Unions, the Central Committee of the All Union Lenin Young Communist League, the All Union Council of War and Labor Veterans, the USSR Ministry of Health, the USSR State Committee for

Labor and Social Problems, the Committee for Soviet Women, arts leagues, and other state and public organizations that are founders of the fund. A portion of the monies in the fund are earmarked for boarding homes for the aged and the disabled. With some 400,000 individuals in the more than 1,700 such residences across the country, and the demand growing (one in six Soviet citizens is above the age of 60), state quotas for the construction of these residences are not being met. One of the aims of the fund is to set up treatment and labor centers and special enterprises in which the disabled and the chronically ill can work. Local chapters of the fund will operate special crisis centers with hotlines. The fund will take measures to see to it that as many pensioners as possible, especially those with small pensions, obtain all the medications they need at either no cost or at a low cost. Another aim of the fund is to educate the public on healthy lifestyles. The fund, according to the chairman of its organizing committee, S. N. Fedorov, does not intend to organize the aged and the disabled within a rigid framework of programs and measures; rather, it will facilitate in every way possible the development of all kinds of medical and social aid and will support initiatives in that direction.

UDC 613.1:613.95

**Effects of Air Pollution on Child Health**  
18400493b Kiev VRACHEBNOYE DELO in Russian  
No 4, Apr 88 (manuscript received 24 Sep 86)  
pp 112-113

[Article by I. I. Datsenko, A. B. Denisyuk, S. L. Doloshitskiy, Ye. I. Tolmacheva, L. A. Dychok and B. A. Plastunov, Chair of General Hygiene, Lvov Medical Institute]

[Abstract] A study was conducted on the incidence of upper respiratory tract infections and the health index of preschool children in Lvov in relation to the level of air pollution. An analysis of 3900 cases over the last 10-15 years showed that the overall morbidity of children in the most seriously polluted districts (CO levels exceeded MAC 12.6- to 16.3-fold, nitrogen oxide 2.1- to 4.3-fold) was 1.3- to 1.5-fold higher than in children with relatively clean air (CO levels 1.1-fold below MAC). The highest incidence of disease was observed in the 2 and 3 year olds. In addition, the mean health index was significantly lower (1.8- to 2.5-fold) for the children in heavily polluted districts than in the relatively clean districts. These observations were considered in formulating health plans for the 11th and the 12th Five Year Plans in order to control and reduce air pollution in Lvov by controlling vehicular traffic and disposition of manufacturing plants. References 7 (Russian).



**Signal Detection Against Background of Noise by an Individual Working in a Group**

18400476 Tbilisi SOOBSHCHENIYA AKADEMII  
NAUK GRUZINSKOY SSR in Russian Vol 129 No 2,  
Feb 88 (manuscript received 26 Jun 86) pp 421-424

[Article by M. A. Tsiskaridze, E. N. Buchukuri and L. G. Kevlishvili, Institute of Cybernetics, GSSR Academy of Sciences]

[Abstract] Modern complex systems require group work among operators, and this creates new problems calling for the study of psychosocial variables (one of which is conformity) which determine the quality of work an operator performs in a group. This study of conformity of individuals during signal detection against a background of noise tested 20 subjects ranging in age from 27 to 45 and involved 2 groups of experiments with equiprobable and non-equiprobable stimuli. Noise stimuli included white noise and a 400 Hz tonal stimulus. The

effect of the group on the individual was identified by comparing the individual's performance in a group with his performance when he worked alone. The Svets and Tanner model for signal detection was used. Subjects were placed in one of two groups according to the frequency of agreement of responses of naive subjects with those of the others. Group I included subjects for whom the number of agreements was greater than the average for the whole group, and group II included those for whom the number of agreements was less. Behavior of a person in a group differed from that in individual experiments. The basic difference between the groups was a higher number of proper identifications in group I subjects. The effect of the group on the individual manifested itself in both groups, but differently and to a different degree. Whatever the cause of differences in group I and group II subjects in individual experiments, differences between them in group experiments were due to the conformity of group I subjects and the independence of group II subjects. References 3 (Russian).



**New Approach to Intensification of Effects of  
Postradiation Restoration in Animals of Different  
Species**

18400415b Moscow DOKLADY AKADEMII NAUK  
SSSR in Russian Vol 300 No 2, May 88 (manuscript  
received 24 Jul 87) pp 472-475

[Article by L. M. Rozhdestvenskiy, Ye. N. Shcherbova  
and V. N. Limarenko, Institute of Biophysics, Moscow]

[Abstract] An assessment of postradiation effectiveness of bone marrow exfusion performed on animals of different species and a study of the possibility of restoring stem potentials of irradiated bone marrow during its incubation under different conditions involved 4 species of laboratory animals: 18-22 g  $F_1$ (CBA X C57B1) male mice, 180-220 g male rats, 280-450 g male guinea pigs and 12-18 kg mongrel dogs. Animals underwent whole body  $^{137}\text{Cs}$  or  $^{60}\text{Co}$  gamma irradiation with dose power of 2 Gy/min or 0.36-0.38 Gy/min, respectively. In the first series of experiments, anesthetized animals underwent exfusion, immediately after irradiation, of  $\frac{1}{3}$  to  $\frac{1}{2}$  of the bone marrow from the femur (mice and rats) or from the tibia (guinea pigs) by inserting a needle through the epiphysis into the bone marrow cavity and simultaneous injection of medium 199 through one syringe and extraction of it through another. As soon as 1.5 h after myeloexfusion, there was a statistically significant increase in the concentration of colony-forming units/spleen (CFU-S) and colony-forming units/bone marrow (CFU-BM) in nontraumatized bone marrow of irradiated mice (8.5 Gy dose). A second series of experiments revealed the effectiveness of restoration of stem potentials of irradiated bone marrow after its incubation in vitro under the following conditions: medium 199 with addition of 100 units/ml of penicillin and 0.05 mg/ml of streptomycin. Mice recipients were irradiated at 8.5 Gy and donors were irradiated at 7 Gy immediately followed by bone marrow extraction. In comparison with administration of irradiated donor cells shortly after their extraction, 3-hour incubation of such cells eliminated CFU-S, but increased indirectly determined CFU-BM. Addition of cycloheximide to the incubation medium inhibited elimination of CFU-S and increased CFU-BM after both 3-hour and 6-hour incubation. Cycloheximide weakened elimination of bone marrow nuclear cells in vitro. Thus, 3- to 6-hour incubation of irradiated cells in the presence of cycloheximide partially restored stem potentials of irradiated bone marrow with predominant realization of the myeloid pathway of differentiation. A third series of experiments, called EIR (explantation, exfusion of bone marrow after irradiation, incubation of it under conditions described above and reimplantation into the same body) combined the approaches used in the first 2 series of experiments. The procedure began within 10-20 minutes after irradiation in LD<sub>90-95/30-45</sub> doses. Myeloexfusion differed from that of the 1st series of experiments by exfusion of a large quantity of bone marrow and by passage of less fluid through the bone. In most experiments, the EIR procedure produced pronounced therapeutic effect on the irradiated animals. The highest effect was observed with

the use of cycloheximide. A separate experiment revealed the role of basic factors in the effect of the entire procedure. The most significant factor of the EIR procedure was the previously exfused bone marrow cells returned into the irradiated body after incubation. Apparently both explantation and reimplantation of the incubated cells "work" in interaction in the EIR procedure. Figure 1; references 10: 8 Russian; 2 Western.

UDC 615.849.1.015.3.07

**Measurements of Radiation Dose Fields With  
Various Detectors**

18400507a Moscow MEDITSINSKAYA  
RADIOLOGIYA in Russian Vol 33 No 4, Apr 88  
(manuscript received 22 Jun 87) pp 55-59

[Article by S. M. Vatsitskiy, I. A. Yermakov, O. A. Shtukovskiy, V. S. Khrunov, S. S. Martynov, Kh. Yarovinen and A. Vyananen, Central Scientific Research Roentgenoradiological Institute, USSR Ministry of Health, Leningrad; Riga Scientific Research Institute of Radioisotope Instrumentation; Finnish Center for Radiation and Nuclear Safety, Helsinki]

[Abstract] A comparative analysis was conducted on three types of radiation detectors in the measurement of electron and photon dose fields. The studies were conducted with two types of ionization chambers (Dosetek and NACP), a semiconductor silicon detector (Therados), and an experimental diamond detector (0.2 mm thick diamond plate, 8 mm<sup>2</sup> area, 250 V grid bias, dark current less than  $10^{-12}$  A). Used in a CADSCAN dose field analyzer all three types of detectors gave good agreement with 18 MeV inhibitory radiation. Small differences at small phantom depths (2-3 mm) were attributed to differences in distance between the surface of the phantom and that of the detector. With 4, 17, and 20 MeV electron beams the results for the diamond detector and the ionization chambers were essentially identical for absorbed dose calculations, while the results with the silicon detector were significantly higher. The signal obtained from the diamond detector as it moves along the axis of the phantom represented the absorbed dose of the aqueous phantom and did not require additional corrections as to the ionization chambers. Figures 4; references 8: 3 Russian, 5 Western.

UDC 615.47.03:615.849.12

**Diamond Detectors of Ionizing Radiation**

18400507b Moscow MEDITSINSKAYA TEKHNICA in  
Russian No 3, May-Jun 88 (manuscript received  
31 Mar 87) pp 7-12

[Article by V. C. Khrunov, S. S. Martynov, N. P. Marchenko, S. M. Vatsitskiy and I. A. Yermakov, Central Scientific Research Roentgenoradiological Institute, Leningrad]

[Abstract] Further analysis was conducted on the functional characteristics of diamond detectors with potential application in medical radiology for monitoring dose fields of radiotherapeutic equipment. The detectors

under study employed detecting plates 0.2-0.3 mm thick with a detection area of 6 to 10 mm<sup>2</sup>, a dark current of less than 10<sup>-12</sup> A, grid bias 150 to 250 V, and a recording sensitivity of 10<sup>-6</sup> to 10<sup>-7</sup> coulombs/Gy. Studies with photon emissions showed that the signal of the diamond detectors was linear (within plus or minus 2 percent) over a 0.05 to 30 Gy/min range. Similar results were obtained with detection of 15 MeV electrons over a 0.5-5 Gy/min range. The sensitivity of the diamond detectors remained unchanged over the photon energy range of 0.090 to 15 MeV, with a reduction in sensitivity of less than 20 percent in the 0.060 to 0.090 MeV range. Extensive measurements demonstrated that sensitivity remained constant (within 1 percent) with continuous

and discontinuous use. Furthermore, a stationary sensitivity level was obtained after a wait state that was independent of the energy and nature of irradiation (using 1-15 MeV photons and 8-17 MeV electrons) after a preliminary 0.5-5 Gy irradiation. Evaluation of data on distribution of absorbed photon and electron dose by diamond detectors, ionizing chambers, and silicon detectors showed that the former two were in excellent agreement, while the values obtained with the silicon detector were elevated by 6-8 percent at depths of 15-30 cm. These characteristics of the diamond detectors point to the potential utility of diamond elements as sensors in ionizing radiation detectors. Figures 5; references 12: 6 Russian, 6 Western.

UDC 578.835.21-083.33

**Solid-Phase Complement Fixation Test for  
Foot-and-Mouth Disease**

18400513 Moscow LABORATORNOYE DELO in  
Russian No 6, Jun 88 (manuscript received 30 Sep 86)  
pp 49-52

[Article by Zh. A. Shazhko and V. A. Mishchenko,  
All-Union Scientific Research Institute of Foot-and-  
Mouth Disease, USSR Ministry of Agriculture, Vladi-  
mir]

[Abstract] An analysis was conducted on the factors  
contributing to the reliability and sensitivity of the  
solid-phase complement fixation test developed by Gay-  
damovich and Lavrova for the diagnosis of foot-and-  
mouth disease. Using various pure preparations of the  
virus as well as infected tissues and antisera raised in

guinea pigs, conditions were defined that led to  
improved performance. Maximum sensitivity of the test  
was obtained when adsorption of the antigen to the wells  
was conducted at either 37°C for 4 h, at room tempera-  
ture for 6-8 h, or at 4°C for 8-18 h. In addition, the  
buffers ensuring optimum reliability of the test were 0.05  
M carbonate-bicarbonate buffer, pH 9.6, or tris-HCl  
buffer, pH 7.4. Prolonging the first phase of the test to 60  
min at 37°C led to an increase in the antigen titer to 1:32  
from 1:4, and of the antibody to 1:40 from 1:20. In  
addition, both sensitivity and reproducibility of the  
results were enhanced by drying the carrier with the  
adsorbed antigen at 40-50°C with ventilation and fixa-  
tion with 70-80 percent acetone or ethanol. The steps  
identified here were seen as key factors in transforming  
the test into a quantitative procedure for the diagnosis of  
foot-and-mouth disease. References 4: 2 Russian, 2  
Western.

UDC 578.85:86.03.33.24

**Interaction of Tobacco Mosaic Virus and Immobilized Antibodies**

18400499 Tashkent *UZBEKSKIY BIOLOGICHESKIY ZHURNAL* in Russian No 2, Mar-Apr 88 (manuscript received 5 Mar 87) pp 10-12

[Article by A. Kh. Vakhobov, O. K. Zakirova, A. Z. Zaitova and M. M. Rakhimov, Institute of Microbiology, Uzbek SSR Academy of Sciences]

[Abstract] Trials were conducted with immobilized antibodies against the tomato strain of tobacco mosaic virus (TMV) to determine optimum elution conditions. The rabbit antibodies were coupled to a polyamide carrier, with the resultant columns binding 3.41 mg of TMV, or 27.2 mg per 1 mg of the adsorbent. Trials with a 0.05 M tris-HCl elution buffer over a pH range of 7.5-11.0 showed that maximum desorption prevailed in the pH 10.5-11 range. Maximum elution was obtained at pH 11 in a system complemented by the addition of 1 M KCl. In the latter case, high yields of TMV were combined with retention of infectivity and absence of denaturation. Figures 2; references 5 (Russian).

UDC 616.98:578.878.6]-092:612.017.1.064]-06:616.61

**Kidney Damage in Patients Infected With Human Immunodeficiency Virus**

18400506 Moscow *TERAPEVTICHESKIY ARKHIV* in Russian Vol 60 No 6, Jun 88 (manuscript received 10 Feb 88) pp 127-129

[Article by S. N. Savitskiy, T. I. Irova, E. P. Vostrikova, A. Yu. Denisov, and A. P. Redkin, Moscow]

[Abstract] AIDS cases have now been reported in the USSR among Soviets as well as foreign citizens. The authors examined 41 AIDS patients (36 men and 5 women, 23-65 years old). All were foreign citizens, chiefly residents of central African countries. Two of these patients exhibited diffuse parenchymal kidney disorders: one diagnosed with glomerulonephritis, the other with acute renal insufficiency. Detailed clinical reports were given in both cases. The damage in the first patient (a 56-year-old individual from central Africa) was believed to have resulted from the development of immunocomplex glomerulonephritis with nephrotic syndrome and renal insufficiency and may have been linked to previous alcoholism. In the second patient (a 64-year-old individual from the Caribbean basin), a possible bladder tumor or an adenoma of the prostate gland, with acute retention of urine, may have contributed to his kidney problem. References 9: 2 Russian, 7 Western.

UDC 576.895.421.095.421.095.37:578.833.26

**Dermacentor Marginatus Age Factors in Reproduction of Tick-Borne Encephalitis (TBE) Virus**

18400514a Moscow *MEDITSINSKAYA PARAZITOLOGIYA I PARAZITARNYYE BOLEZNI* in Russian No 3, May-Jun 88 (manuscript received 3 Dec 87) pp 17-21

[Article by A. N. Alekseyev, I. V. Razumova, S. P. Chunikhin and I. A. Reshetnikov, Institute of Poliomyelitis and Viral Encephalitis, USSR Academy of Medical Sciences; Institute of Medical Parasitology and Tropical Medicine imeni Ye. I. Marsinovskiy, USSR Ministry of Health, Moscow]

[Abstract] Brain suspensions of TBE virus-infected white mice were used for infection of female *Dermacentor marginatus* ticks divided on a physiological basis into three age groups (2nd, 3rd, 4th), in order to assess tick age factors on the reproduction of the virus. The three groups, so-called 2nd, 3rd and 4th, were selected on the basis of an age-group separation described earlier by Bulashov and, again, by Razumova. Infection of the ticks with the brain supernatants had no significant effect on tick survival in the 2nd and 3rd age groups, but diminished the survival rates for ticks in the 4th group. Each category of ticks could be divided into two classes on the basis of high or low levels of the TBE virus reproduction. The fact that the virus was isolated regularly from the saliva of 3rd age group ticks but from none in the 2nd group and from only one case in the 4th age group indicates that the 3rd age group presents the greatest epidemiological risk. In general, with increasing age the secretory activity of the dermal glands decreased. However, in TBE virus-infected ticks saliva production was increased. Figures 1; references 8: 7 Russian, 1 Western.

UDC

615.281.8.015.4:576.895.771+576.895.771.095.18:615.281.8

**Effects of Viral Insecticide Viroden on Aedes Aegypti**

18400514c Moscow *MEDITSINSKAYA PARAZITOLOGIYA I PARAZITARNYYE BOLEZNI* in Russian No 3, May-Jun 88 (manuscript received 16 Dec 87) pp 52-54

[Article by M. A. Kuznetsova and L. P. Buchatskiy, Kiev University imeni T. G. Shevchenko]

[Abstract] Experimental studies were conducted on the effectiveness of viroden, an insecticide based on the mosquito densovirus, using 2 percent preparations representing a 5-fold reduction in the concentration commonly employed in mosquito control. Trials with male and female *Aedes aegypti* mosquitoes under controlled conditions showed a 11.37 percent reduction in the number of pupae, as well as a 26.78 percent decrease in the yield of imagoes. In the first gonotrophic



cycle a 26.87 percent reduction was observed, and in the second cycle the decrease was 34.08 percent. The reductions in females were somewhat higher than in males. Female fertility was also diminished. On an overall basis,

2 percent viroden was effective in reducing the *A. aegypti* counts by 59 percent, including a reduced hatching frequency from eggs laid by infected females. Figures 1; references 9: 8 Russian, 1 Western.

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